METAMORPHOSIS AUSTRALIA

Magazine of the Butterfly & Other Invertebrates Club Inc.

(RRP $6.00)

https://www.boic.org.au

Issue: 105 March 2023 ISSN: 1839-9819

BUTTERFLY & OTHER INVERTEBRATES CLUB INC.

Aims of the organisation

- To promote the importance of invertebrates in the environment
- To hold information meetings and organise excursions around the theme of invertebrates
- To promote the conservation of the invertebrate habitat and encourage the growing of butterfly host plants
- To promote research into invertebrates
- To encourage the construction of invertebrate friendly habitats in urban areas

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Membership

Annual fees are $30 for families, individuals, schools, organisations.
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General meetings

Quarterly meetings, are held with guest speakers and to organise BOIC events.

Deadlines for publishing in *Metamorphosis Australia*

If you wish to submit an item for the publication the following deadlines apply:
1 February (March Issue), 1 August (September Issue).

All articles should be submitted directly to the Editorial Committee: secretaryboic@gmail.com.

Disclaimer

This publication seeks to be as scientifically accurate as possible. The views opinions and observations expressed are those of the authors. It is a platform for people, both amateur and professional, to share information, news and images of butterflies and other invertebrates. The submitted manuscripts are reviewed with editorial changes suggested if applicable. The editorial committee reserves the right to refuse to publish matter that it deems unsuitable for publication.

Cover image: Photograph courtesy of Claire Watson,
Harlequin Metalmark (*Praetaxila segecia*)

Typeset by Sunset Publishing Services Pty Ltd, Brisbane
Printed by PrintConnect Australia, Brendale

Hello from the President

Welcome to the first issue of *Metamorphosis Australia* for 2023, Issue No. 105. As usual, the standard of the magazine is exceptional. Of particular interest in this issue is the extensive and encompassing report by Cliff Meyer on his personal collecting and observation records of the butterflies of Iron Range (Kutini-Payamu National Park). Cliff has a very broad knowledge with decades of experience of the butterfly diversity of this biologically rich area. Second to the wet tropics it is the richest known area for butterflies in all of Australia. The last tabled list of butterfly species known from Iron Range was in 1972 by G.B. Monteith*. Thus, this up-to-date recording of known species from the area is long overdue and is a very welcome addition to our knowledge of Australian butterflies. The club is blessed to have an active member such as Cliff to share his vast knowledge of this unique area. Additionally, congratulations to Wesley Jenkinson for being a worthy recipient of the 2022 Entomological Society of Victoria's J.C. ("Zoo") Le Souef Memorial Award for his service in the field of entomology. This issue also contains several book reviews, two club field trip reports and two transcripts of presentations given at club meetings in 2022. All round, a very balanced magazine and I thank sincerely all the contributors who provided articles to make it another excellent edition.

Take care all.

Sincere regards

Trevor

* Monteith, G.B., 1972. A list of butterfly records from the Iron Range area of Cape York Peninsula. *News Bulletin Entomological Society Queensland* **85**: 9–14.

Kutini-Payamu (Iron Range) National Park – a rainforest in recovery

Cliff Meyer, Stephen Brown and Richard Weir

Introduction

The three authors have been collecting together since initial meetings in Darwin in 1991. Our first trip together was in July 1999 to the mecca for Australia's butterflies, which is known to most as Iron Range, but is now known as Kutini-Payamu (Iron Range) National Park (Figs 1–4). Since that inaugural trip we have undertaken in excess of 100 trips around Australia collecting, identifying and reporting on Australia's butterfly fauna. We have now made 14 trips into Iron Range with the most recent being 26 October – 03 November 2022.

Figs 1–4. The first trip together into Iron Range in 1999: 1. Richard, Cliff and Steve ready to head off from Atherton; 2. The fabled signpost to the butterfly mecca; 3. Cliff rehydrating outside our campsite at Gordon Creek #1; 4. Cliff and Richard outside the Gordon Creek #1 campsite

The first trip into Iron Range took us 8.5 hours to drive the ~120 km of dirt road/track from the Peninsula Development Road turnoff 20 km north of the Archer River Roadhouse. The turnoff is now ~50 km north of the Archer and the trip into Lockhart River only took us 1.5 hours this year as a large percentage of the road

has been sealed and all bar a few creek and river crossings remain. The sometimes-challenging Wenlock and Pascoe River crossings of the early years have also been significantly improved with solid concrete causeways making traction during higher water levels safer. Over the period that the authors have been travelling into Iron Range, the rainforest has been impacted by several tropical cyclones. On 19 April 2006, Tropical Cyclone Monica crossed the coast some 40 km south of the Lockhart River township smashing the overstorey trees between Phillip Hill and Mount Lamond, making the majority of access between the two hilltops impassable. On 3 February 2011, Tropical Cyclone Yasi made landfall near Mission Beach with the effects also being felt at Iron Range, but on 19 March 2019, Tropical Cyclone Trevor (named after our illustrious President no doubt) crossed the coast just south of the Lockhart River township causing significant devastation to the rainforest, snapping off many of the large overstorey trees along the ridgelines and along the rivers and creeks and defoliating much of the rainforest (Figs 5–8, 15–17).

Rainforest damage following Cyclone Trevor – photographs taken during the 2019 survey

Figs 5–8. Iron Range rainforest damage three months after Tropical Cyclone Trevor hit Lockhart River on 19 March 2019: 5. West Claudie River environs; 6. Gordon Creek #3 environs; 7. Gordon Creek between #1 and #2 crossings; 8. Looking right towards Phillip Hill from what was the Tree Ways junction

As part of the Queensland Entomological Society's previous and current permit requirements all members endorsed under the permit are required to provide a plain English report to the respective Cape York Peninsula Aboriginal Land (CYPAL) Corporation within 12 weeks of being on Country. We have provided four such reports since 2019. Dawn Franzmann suggested to Cliff that the BOIC members would be interested in reading of our exploits and asked if we could put something together for the magazine. This article has been developed in response to this request and is a consolidation of the three plain English reports provided to the Kuuku Ya'u Aboriginal Corporation covering our 2019, 2021 and June 2022 surveys and also includes Cliff's 2017 observations.

Results and observations

The surveys were conducted in the area stretching from Mt Toza in the west, through the West Claudie River, Claudie River, and Gordon Creek environs north along Portland Road to the Scrubby Creek rainforest. As previously mentioned, Cyclone Trevor caused significant damage to the rainforest overstorey, which not only made access to the hilltops above the Gordon Creek environs extremely difficult (e.g.: Phillip Hill and Mt Lamond), but significantly impacted canopy butterfly species through loss of habitat. During the 2019 survey, one of us (CEM) (the youngest, fittest and dumbest) made his way from the Portland Road access point up through the rainforest along the old observation track towards Phillip Hill and then on towards what is known in butterfly collecting circles as 'the Knoll', a prominent high point between Phillip Hill and Mt Lamond further to the north. In 2017 (pre-Cyclone Trevor) it took just 20–30 minutes to make the trek up to the Knoll. In 2019, after getting lost at the entrance to the track for the first 20 minutes due to the hotchpotch of fallen trees, it took a total of 4.5 hours of hacking through, crawling over and under the fallen debris to get to the Knoll only to miss the key butterfly flight periods and then have to face the journey back down to the road again for the afternoon pickup. Figure 8 provides readers with an appreciation of the damage caused by Cyclone Trevor along the ridgeline between the two hilltops as the photograph was taken at what is known as the 'Three Ways' in the saddle below Phillip Hill. In 2017, the overstorey was 30 feet above where it is now and the Three Ways was in dappled darkness. Access to the ridgelines and hilltops above the Gordon Creek environs is now largely impassable without long hours of hacking your way through the undergrowth. Access to the hilltops was not attempted during the 2021 or June 2022 surveys following feedback from local ranger staff.

In 2019 a total of 77 species of butterfly were recorded in the park over the survey period compared to 44 species recorded during the previous survey in July 2017. Many rainforest understory butterflies (e.g.: Bush-browns, Ringlets and Grass-yellows) were observed in 2019 that were not observed in 2017 prior to the cyclone, which is to be expected as understory plants supporting these butterflies flourish with the availability of more sunlight. The record of the Orange Emperor, *Charaxes latona* Butler, 1865 was significant as the authors had not seen this butterfly in the park in over 10 years. Very few adult or immature stages (egg, larva, pupa) of the Blues family of butterflies (Lycaenidae) were observed during the 2019 survey period. This may have been due to damage to juvenile foliage and the flowering ability of the rainforest during and shortly after Cyclone Trevor.

In 2021, a total of 78 species of butterfly were recorded over the survey period compared to 77 species recorded during the July 2019 survey. Seventeen species recorded in 2019 were not seen in 2021 but an additional 17 species were recorded in 2021. A total of 95 species of butterfly were recorded by the authors across both the 2019 and 2021 survey periods. A further 10 species of butterfly were recorded in 2017 but have not been seen by the authors since Cyclone Trevor. As in 2019, very few adult or immature stages (egg, larva, pupa) of the Lycaenidae were observed.

On 06 June 2021, one of us (CEM) collected a male Spotted Crow Eggfly, *Hypolimnas antilope mela* Fruhstorfer, 1903 (Figs 9, 10), the first record of this butterfly from mainland Australia. It was previously known only from Torres Strait some 350 km north of Lockhart River. The discovery was published in *The Australian Entomologist* on 25 March 2022.

Figs 9–10. Spotted Crow Eggfly, *Hypolimnas antilope mela* Fruhstorfer, 1903 collected near Cooks Hut, Kutini-Payamu (Iron Range) National Park on 06 June 2021: 9. Upper side; 10. Underside

The June 2022 survey was hampered by the ongoing late wet season with all but the first day impacted by rain or heavy overcast conditions. Without sun many butterflies do not fly. The rainforest regrowth had however, significantly improved over the past 12 months. Despite the inclement weather, a total of 80 species of butterfly were recorded over the period (including observations made by Claire Watson, Daniel Meier, Sophie Frame and Maurice Allan), compared to 78 species recorded during the July 2021 survey. The authors recorded eight new species during the June 2022 survey which had not been seen since Cyclone Trevor. A total of 113 species of butterfly have now been recorded by the authors in Iron Range since 2017. Six species of butterfly recorded in 2017 have not been observed by the authors since Cyclone Trevor, largely due to accessibility to the Phillip Hill and Mt Lamond areas where the authors have previously encountered these butterflies more commonly than in the Gordon Creek environs. The continued recovery of the rainforest within the park over the past three years has also seen a recovery in the butterfly populations.

The Lockhart River region boasts over 190 species of butterfly, 32 of which are only found on northern Cape York Peninsula and a further 10 are endemic to the park. The authors are yet to encounter the endemic Turquoise Emperor, *Apaturina erminia* and the Azure Moonbeam, *Philiris azula*. Of the other 32 species restricted to northern Cape York Peninsula, the authors are yet to encounter the Orange-banded Plane, *Lexias aeropa* and the Dark Pencil-blue, *Eirmocides consimilis toza*. All four butterflies are only known from a single or a few records and will be an exciting find should we encounter them during future surveys of the park.

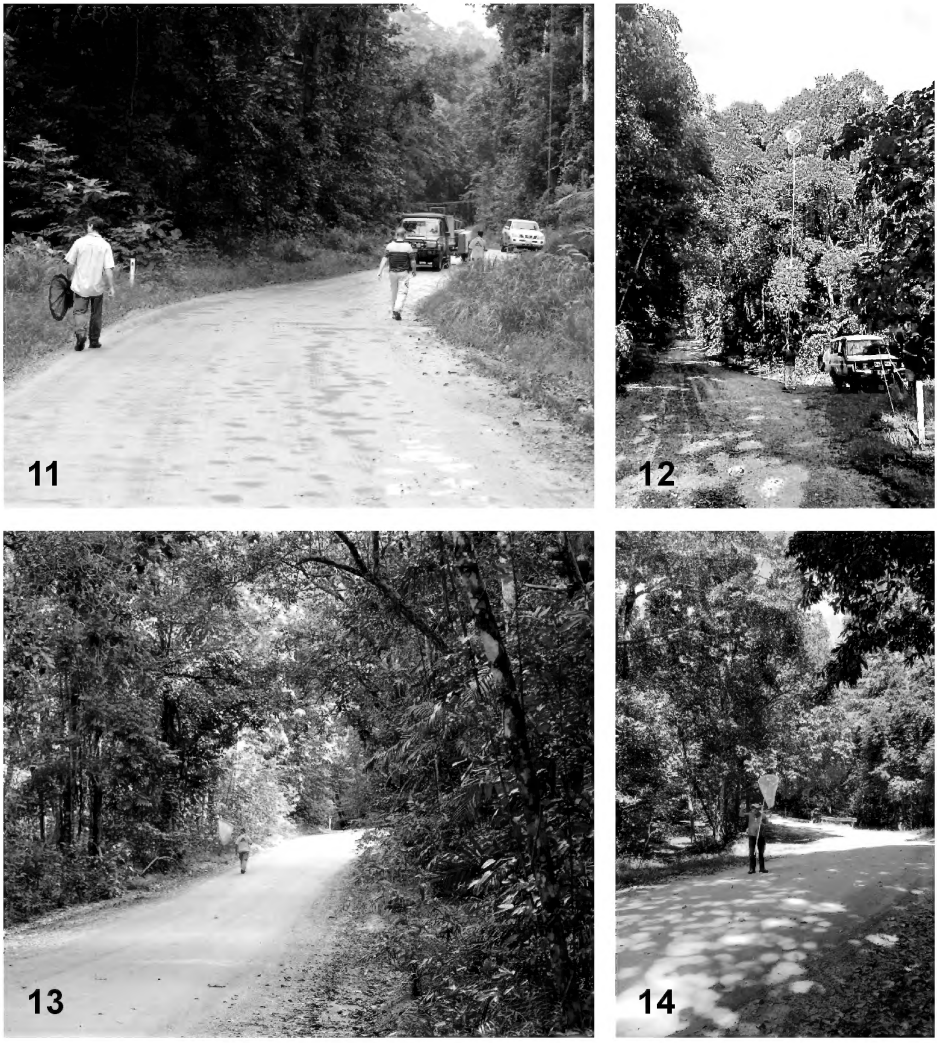
The attached table and photographs list the authors' records and observations from the past four surveys 2017–June 2022.

Acknowledgements

The authors are grateful to Mr Donovan Moses the traditional owner of the land for permission to come on Country in 2019. We are also grateful to Norma Hobson, Chairperson Kuuku Ya'u Aboriginal Corporation for approval to come on Country to conduct the 2021 and 2022 surveys and to Toby Munro, Ranger Coordinator, South Cape York Catchments and Gary Featonby, Ranger-in-Charge, Kutini-Payamu National Park, for facilitating access approvals. We are also grateful to Stu and Lynn Layton and family at the Greenhoose for their ongoing hospitality and enthusiasm for the research that we are conducting. We thank Scott Templeton, a fellow BOIC member, for allowing us to include his photograph in the 2021 report, Claire Watson, Daniel Meier, Sophie Frame and Maurice Allan for allowing us to include their observation records and photographs in the June 2022 report.

All surveys were conducted under the Entomological Society of Queensland scientific permit numbers WITK15793015 (2017), WITK18701717 (2019–2021) and P-PTUKI-100128508 (2022).

Collecting locations prior to Tropical Cyclone Trevor



Figs 11–14. Iron Range prior to Tropical Cyclone Trevor: 11. Cleve Herd, Cliff and Richard on the road near Cooks Hut campground – July 2010; 12. Steve at Gordon Creek #2 crossing – March 2011; 13. Richard on the road between Gordon Creek #2 and #1 crossings – July 2010; 14. Steve at Gordon Creek #3 crossing – July 2016

Records and observations

Common Name[1]	Scientific Name	24–28 July 2017	07–13 July 2019	03–07 June 2021	23–29 June 2022
Swallowtails – Family Papilionidae (9)[2]					
Blue Triangle	*Graphium choredon*	✓	✓	✓	✓
Green Triangle	*Graphium macfarlanei*			✓	
Green-spotted Triangle	*Graphium agamemnon*	✓	✓	✓	✓
Orchard Swallowtail	*Papilio aegeus aegeus*	✓	✓	✓	✓
Fuscous Swallowtail	*Papilio fuscus capaneus*	✓	✓	✓	✓
Ulysses Swallowtail	*Papilio ulysses joesa*	✓	✓	✓	✓
Clearwing Swallowtail	*Cressida cressida cressida*	✓	✓	✓	✓
Red-bodied Swallowtail	*Pachliopta polydorus queenslandicus*	✓	✓	✓	✓
New Guinea Birdwing	*Ornithoptera priamus macalpinei*	✓	✓	✓	✓
Skippers – Family Hesperiidae (23)					
Banded Dusk-flat	*Chaetocneme critomedia*	✓			✓
Bronze Flat	*Netrocoryne repanda expansa*		✓		
Pied Flat	*Tagiades japetus janetta*	✓	✓	✓	✓
Greater Peacock Awl	*Allora major*			✓	
Black-ringed Ochre	*Trapezites petalia*	✓		✓	
Small Orange Ochre	*Trapezites heteromacula*		✓		✓
Brown Ochre	*Trapezites iacchus*	✓	✓	✓	
Spotless Grass-skipper	*Toxidia inornata inornata*		✓	✓	✓
Spotted Sedge-skipper	*Hesperilla ornata monotherma*	✓			✓
Blue-flash Skipper	*Rachelia extrusa*		✓		

Common Name[1]	Scientific Name	24–28 July 2017	07–13 July 2019	03–07 June 2021	23–29 June 2022
Banded Demon	*Notocrypta wagiensis proserpina*		✓	✓	✓
Dingy Swift	*Pelopidas agna dingo*		✓		✓
Lyell's Swift	*Pelopidas lyelli lyelli*			✓	
Orange Grass-dart	*Ocybadisthes ardea*		✓		✓
Wide-brand Grass-dart	*Suniana sunias rectivitta*	✓	✓	✓	✓
Dark Grass-dart	*Suniana lascivia neocles*			✓	
Scrub Darter	*Arrhenes dschilus iris*		✓	✓	✓
Pale-orange Darter	*Telicota colon argeus*			✓	✓
Bright-orange Darter	*Telicota augias krefftii*		✓	✓	✓
Orange Palm-dart	*Cephrenes augiades*			✓	
Purple Swift	*Mimene atropatene*				✓
White-clubbed Swift	*Sabera caesina albifascia*		✓	✓	✓
Yellow-streaked Swift	*Sabera dobboe autoleon*	✓			
Whites and Yellows – Family Pieridae (15)					
Lemon Migrant	*Catopsilia pomona*		✓	✓	✓
Broad-margined Grass-yellow	*Eurema puella*		✓	✓	✓
Lined Grass-yellow	*Eurema laeta sana*		✓	✓	
Macleay's Grass-yellow	*Eurema herla*			✓	✓
Scalloped Grass-yellow	*Eurema alitha*		✓		
Common Grass-yellow	*Eurema hecabe hecabe*		✓	✓	✓
Glistening Pearl-white	*Elodina queenslandica queenslandica*	✓	✓	✓	✓
Cape York Pearl-white	*Elodina claudia*	✓	✓		✓
Orange Albatross	*Appias ada caria*	✓	✓	✓	✓

Common Name[1]	Scientific Name	24–28 July 2017	07–13 July 2019	03–07 June 2021	23–29 June 2022
Yellow Albatross	*Appias paulina ega*		✓		✓
Caper Gull	*Cepora perimale scyllara*		✓	✓	✓
Golden Jezebel	*Delias aruna inferna*	✓			
Yellow-banded Jezebel	*Delias ennia tindalii*				✓
Scarlet Jezebel	*Delias argenthona argenthona*				✓
Red-banded Jezebel	*Delias mysis waterhousei*	✓	✓	✓	✓
Nymphs – Family Nymphalidae (37)					
Cape York Hamadryad	*Tellervo zoilus gelo*	✓	✓	✓	✓
Blue Tiger	*Tirumala hamata hamata*		✓	✓	✓
Lesser Wanderer	*Danaus petilia*		✓	✓	
Swamp Tiger	*Danaus affinis affinis*		✓	✓	✓
Purple Crow	*Euploea tulliolus tulliolus*		✓		
Small Brown Crow	*Euploea darchia niveata*		✓	✓	✓
Two-brand Crow	*Euploea sylvester sylvester*		✓	✓	
Common Crow	*Euploea corinna*		✓	✓	✓
Eichhorn's Crow	*Euploea eichhorni*			✓	
Red Lacewing	*Cethosia cydippe*				✓
Cruiser	*Vindula arsine ada*			✓	
Bordered Rustic	*Cupha prosope prosope*	✓	✓	✓	✓
White-banded Plane	*Phaedyma shepherdi shepherdi*		✓	✓	✓
Yellow-eyed Plane	*Neptis praslini staudingereana*	✓		✓	✓

Common Name[1]	Scientific Name	24–28 July 2017	07–13 July 2019	03–07 June 2021	23–29 June 2022
Black-eyed Plane	*Pantoporia venilia moorei*	✓	✓	✓	✓
Orange Plane	*Pantoporia consimilis consimilis*	✓	✓	✓	✓
Blue Argus	*Junonia orithya albicincta*		✓	✓	✓
Meadow Argus	*Junonia villida calybe*			✓	✓
Chocolate Argus	*Junonia hedonia zelima*		✓	✓	✓
Varied Eggfly	*Hypolimnas bolina nerina*	✓	✓	✓	✓
Blue-banded Eggfly	*Hypolimnas alimena lamina*		✓	✓	✓
Spotted Crow Eggfly	*Hypolimnas antilope mela*			✓	
Lurcher	*Yoma sabina parva*	✓	✓	✓	✓
Ocellated Lurcher	*Yoma algina*	✓			✓
Jezebel Nymph	*Symbrenthia geoffroyi guerini*	✓	✓	✓	✓
Leafwing	*Doleschallia bisaltide australis*	✓	✓	✓	✓
Orange Emperor	*Charaxes latona*		✓		
Palmfly	*Elymnias agondas australiana*			✓	✓
Evening Brown	*Melanitis leda bankia*	✓	✓	✓	✓
Dingy Bush-brown	*Mycaelsis perseus perseus*		✓	✓	✓
Cedar Bush-brown	*Mydosama sirius sirius*			✓	✓
Orange Bush-brown	*Mydosama terminus terminus*	✓	✓	✓	✓
Dusky Knight	*Ypthima arctous arctous*	✓	✓	✓	✓

Common Name[1]	Scientific Name	24–28 July 2017	07–13 July 2019	03–07 June 2021	23–29 June 2022
Pied Ringlet	*Hypocysta angustata angustata*	✓	✓	✓	✓
Orange Ringlet	*Hypocysta adiante adiante*		✓		✓
Orange-streaked Ringlet	*Hypocysta irius*		✓	✓	✓
Brown Ringlet	*Hypocysta metirius*	✓			
Metalmarks – Family Riodinidae (1)					
Harlequin Metalmark	*Praetaxila segecia*				✓
Blues – Family Lycaenidae (28)					
Dark Forest-blue	*Pseudodipsas eone iole*		✓		
Apollo Jewel	*Hypochrysops apollo phoebus*	✓			
Silky Jewel	*Hypochrysops digglesii*				✓
Splendid Jewel	*Hypochrysops cleon*	✓			
Green-banded Jewel	*Hypochrysops theon johnsoni*	✓	✓		
Paradise Jewel	*Hypochrysops hippuris nebulosis*	✓			
Copper Jewel	*Hypochrysops apelles apelles*		✓		
Large Moonbeam	*Philirus papuana kerri*	✓	✓	✓	✓
Bicolour Moonbeam	*Philirus fulgens kurandae*	✓	✓	✓	✓
Purple Moonbeam	*Philirus innotata*		✓	✓	✓
White-margined Moonbeam	*Philirus ziska*	✓			
Blue Moonbeam	*Philirus lucina*	✓	✓	✓	✓
Shining Oak-blue	*Arhopala micale amytis*	✓	✓	✓	✓
White Oak-blue	*Arhopala wildei*				✓

Common Name[1]	Scientific Name	24–28 July 2017	07–13 July 2019	03–07 June 2021	23–29 June 2022
Orange-lobed Flash	*Deudorix epirus agimar*	✓		✓	✓
Black-spotted Flash	*Hypolycaena phorbas phorbas*		✓	✓	✓
Shining Pencil-blue	*Eirmocides helenita*		✓	✓	
Trident Pencil-blue	*Eirmocides margarita*		✓		✓
Small Dusky-blue	*Erina erina*		✓	✓	
Small Green-banded Blue	*Psychonotis caelius*	✓	✓	✓	✓
White-banded Line-blue	*Nacaduba kurava parma*		✓		✓
Purple Cerulean	*Jamides phaseli*		✓	✓	✓
Pale Cerulean	*Jamides cyta claudia*	✓		✓	✓
Pale Pea-blue	*Catochrysops panormus platissa*		✓	✓	✓
Orange-tipped Pea-blue	*Everes lacturnus australis*		✓	✓	
Spotted Grass-blue	*Zizeeria karsandra*			✓	
Dainty Grass-blue	*Zizula hylax*		✓		
Common Grass-blue	*Zizina otis labdalon*				✓
Total species recorded (113)		**44**	**78**	**76**	**80**

Notes/Legend

1. Common name nomenclature follows Braby, M.F. 2016. *The complete field guide to butterflies of Australia.* Second Edition. CSIRO Publishing, Clayton, Victoria.
2. Numbers in brackets in the Family banner represent the total number of species recorded over the four years of surveys.

Butterfly endemic to Kutini-Payamu National Park

Butterfly known from other localities on northern Cape York Peninsula

Butterfly also known from outside northern Cape York Peninsula

Butterfly observation record made by Claire Watson, Daniel Meier, Sophie Frame or Maurice Allan

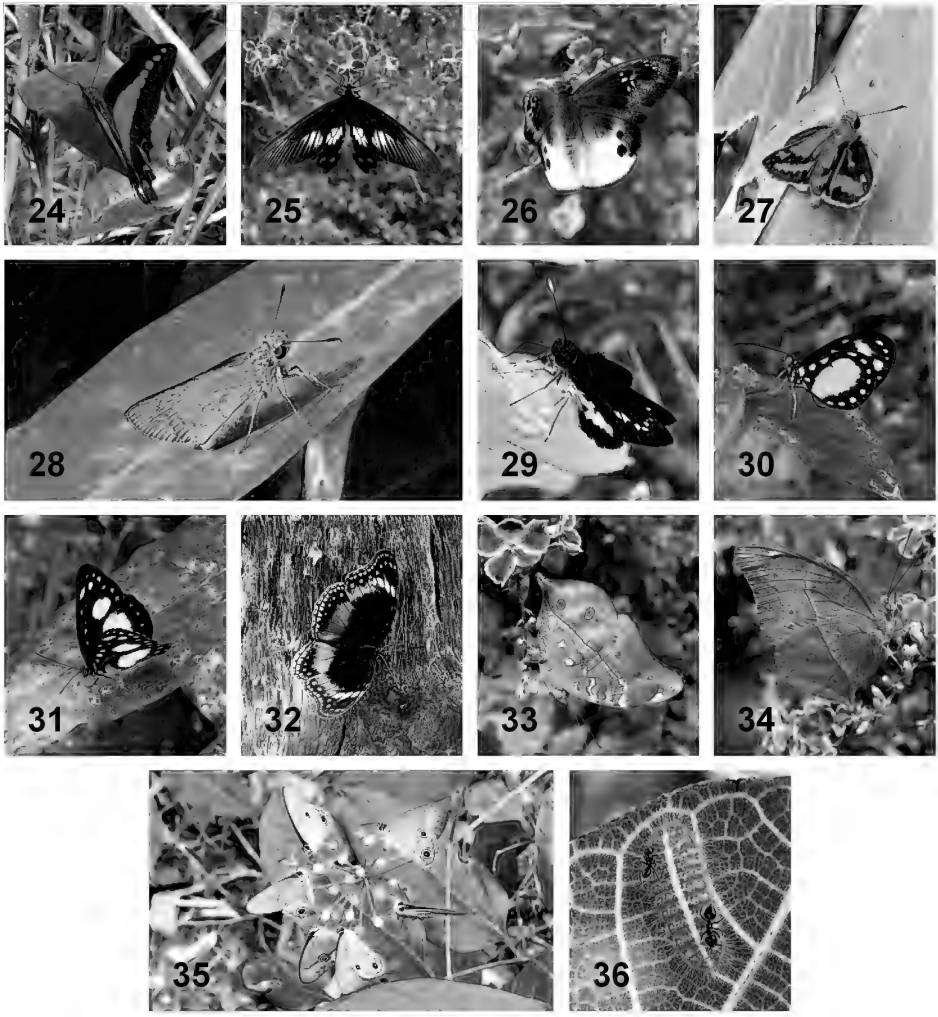
Gordon Creek environs in the years following Tropical Cyclone Trevor

Figs 15–17. July 2019, three months after Tropical Cyclone Trevor: 15. Gordon Creek #1 crossing looking north; 16. Gordon Creek #2 crossing; 17. Gordon Creek #3 crossing

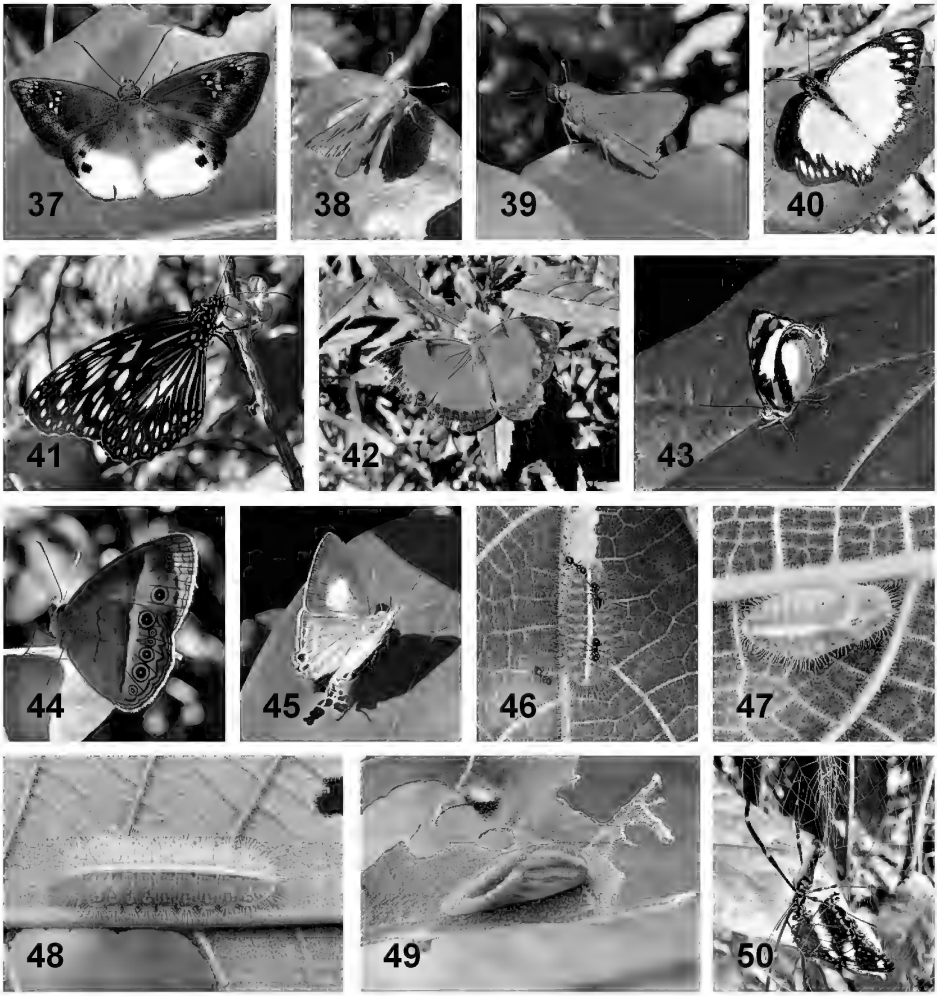
Figs 18–20. June 2021: 18. Gordon Creek #1 crossing; 19. Gordon Creek #2 crossing; 20. Gordon Creek #3 crossing

Figs 21–23. June 2022: 21. Gordon Creek #1 crossing; 22. Gordon Creek #2 crossing; 23. Gordon Creek #3 crossing

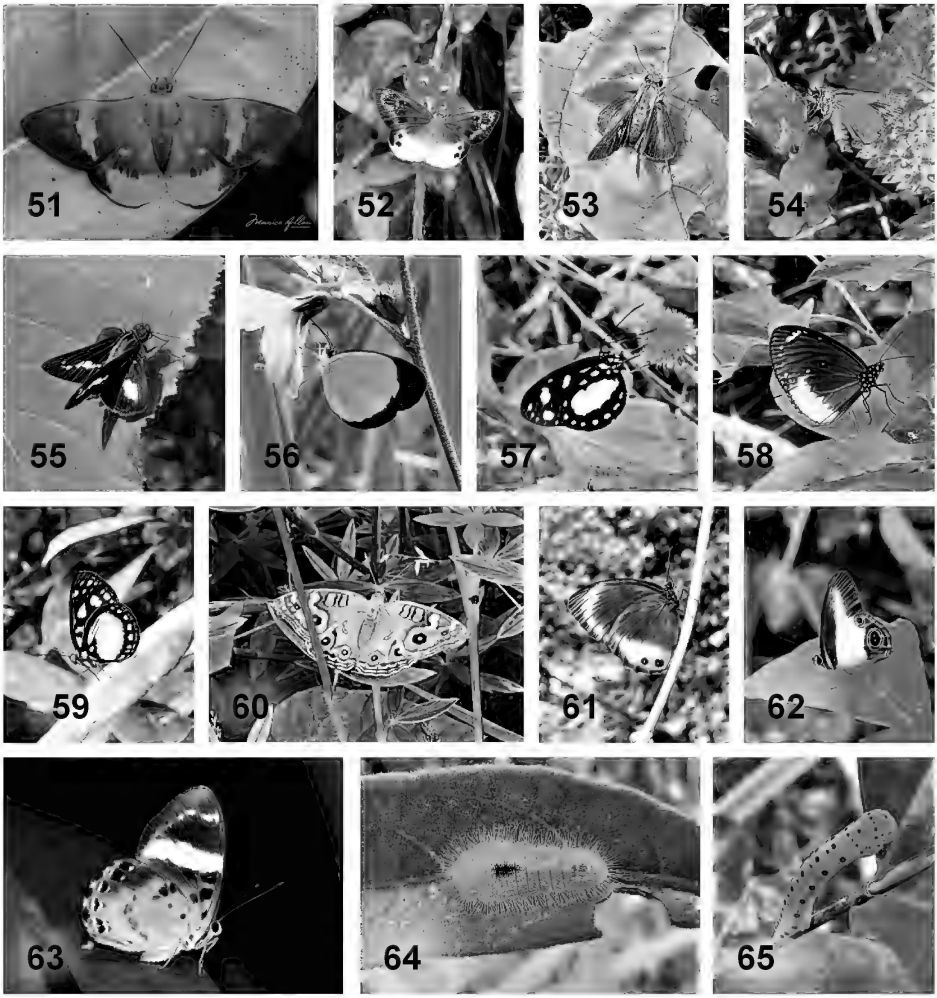
Butterfly photographs taken during surveys



Figs 24–36. Butterfly photographs taken during the 2019 survey (*Note*: Figures not to scale): 24. Male Blue Triangle, *Graphium sarpedon*; 25. Male Red-bodied Swallowtail, *Pachliopta polydorus*; 26. Male Pied Flat, *Tagiades japetus janetta*; 27. Male Wide-brand Grass-dart, *Suniana sunias rectivitta*; 28. Female Bright-orange Darter, *Telicota augias*; 29. Male White-clubbed Swift, *Sabera caesina*; 30. Male Cape York Hamadryad, *Tellervo zoilus gelo*; 31 Male Black-eyed Plane, *Pantoporia venilia*; 32. Male Blue-banded Eggfly, *Hypolimnas alimena lamina*; 33 & 34. Undersides of male and female Leafwing, *Doleschalia bisaltide*; 35. Orange-streaked Ringlets, *Hypocysta irius*; 36. larva of the Purple Moonbeam, *Philiris innotata* with attendant *Crematogaster* sp. ants on its host plant the Sandpaper Fig, *Ficus opposita*



Figs 37–50. Butterfly photographs taken during the 2021 survey (*Note*: Figures not to scale): 37. Male Pied Flat, *Tagiades japetus janetta*; 38. Female Pale-orange Darter, *Telicota colon argeus*; 39. Male Orange Palm-dart, *Cheprenes augiades*; 40. Male Caper Gull, *Cepora perimale*; 41. Blue Tiger, *Tirumula hamata*; 42. Male Bordered Rustic, *Cupha prosope*; 43. Pale form male Jezebel Nymph, *Symbrenthia* (formerly *Mynes*) *geoffroyi* (Photo: Scott Templeton); 44. Male Orange Bush-brown, *Mydosama* (formerly *Mycalesis*) *terminus*; 45. Female Black-spotted Flash, *Hypolycaena phorbas*; 46 & 47. Larva and pupa of the Purple Moonbeam, *Philiris innotata*; 48. Larva of the Bicolour Moonbeam, *Philiris fulgens* on host plant *Litsea breviumbellata*; 49. Pupa of the Large Moonbeam, *Philiris papuanus kerri* on host plant *Litsea breviumbellata*; 50. A male Varied Eggfly, *Hypolimnas bolina* becomes lunch for a Golden Orb Spider



Figs 51–65. Butterfly photographs taken during the 2022 survey (*Note*: Figures not to scale): 51. Male Dusk Flat, *Chaetocneme critomedia* (Photo: Maurice Allan); 52. Male Pied Flat, *Tagiades japetus janetta*; 53. Female Dingy Swift, *Pelopidas agna*; 54. Male Wide-brand Grass-dart, *Suniana sunias rectivitta*; 55. Male White-clubbed Swift, *Sabera caesina*; 56. Female Broad-margined Grass-yellow, *Eurema puella*; 57. Male Cape York Hamadryad, *Tellervo zoilus gelo*; 58. Female Small Brown Crow, *Euploea darchia niveata*; 59. Male Yellow-eyed Plane, *Neptis praslini*; 60. Female Meadow Argus, *Junonia villida*; 61. Male Palmfly, *Elymnias agondas*; 62. Male Pied Ringlet, *Hypocysta angustata*; 63. Female Harlequin Metalmark, *Praetaxila segecia* (Photo: Claire Watson); 64. Larva of the Large Moonbeam, *Philiris papuanus kerri* on host plant *Litsea breviumbellata*; 65. Larva of the 4 O'clock Moth, *Dysphania numana*

Life history notes on the Purple Moonbeam, *Philiris innotata* (Miskin, 1874) (Lepidoptera: Lycaenidae)

Wesley Jenkinson

Introduction

The Purple Moonbeam, *Philiris innotata* (Miskin, 1874) (Fig. 1), previously known as the Common Moonbeam, occurs in mainland New Guinea and from Cape York to Weipa on the gulf coast, and all of coastal and subcoastal eastern Queensland into north-eastern New South Wales as far south as Port Macquarie. A separate population also occurs inland at Carnarvon Gorge (Common and Waterhouse 1981). The mapped range in Braby (2000) increased in Braby (2016) to include the dry coastal and subcoastal region of central Queensland. This dry area previously separated two subspecies: *P. i. innotata* (Miskin, 1874) to the south and *P. i. evinculis* (Wind and Clench, 1947) to the north (Common and Waterhouse 1981). Due to considerable adult variation within local populations both north and south, this separation could no longer be justified (Braby 2000).

In south-eastern Queensland and northern New South Wales this species is chiefly encountered along rainforest margins and in riparian situations and occasionally dry vine forest where its main local host plant, *Ficus coronata,* grows. Further north, along the central coast to just north of Townsville and inland at Carnarvon Gorge, it can be found using *Ficus opposita* in open forest, woodland and riparian vine thicket. It also occurs in the monsoon forests of far northern Queensland. In addition, myself and others have found the adults in suburban gardens where *Ficus* has been planted. It is generally a locally common butterfly where the host trees are growing.

Description

The sexes can be determined by the upper-side wing pattern. Males are bright purple with a black margin whilst the female is black with a dark blue central area, usually with a bluish-white suffusion towards the centre of the forewing (Figs 2, 3). The underside of both sexes is similar, being bright white (Figs 4, 5). In addition, when compared with females, the male wing termen is

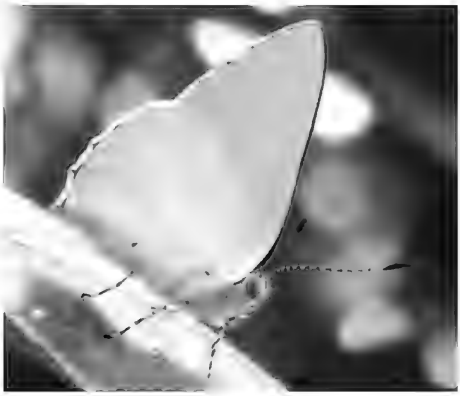


Fig. 1. Territory-defending male

slightly straighter and the abdomen is slightly longer and thinner. Males show very little variation. The female's upper-side varies in the extent of the central blue area and the bluish-white suffusion across the forewing. No known adult seasonal variation has been documented.

Wingspans for the adults are typically: males 24 mm and females 25 mm (Figs 2–5).

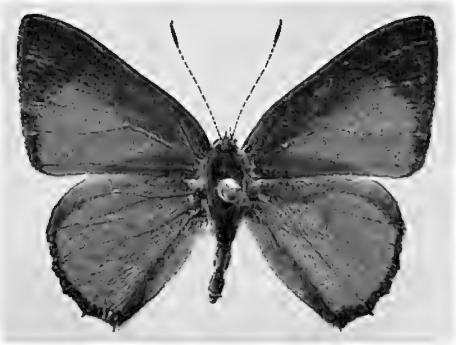


Fig. 2. Male upper (SEQ)

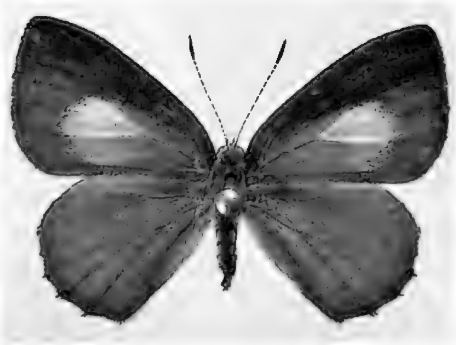


Fig. 3. Female upper (SEQ)

Fig. 4. Male under (SEQ)

Fig. 5. Female under (SEQ)

Larval hosts

The butterfly is only known to utilise plants in the genus *Ficus* (Moraceae). As indicated above, these include three native species, *F. congesta*, *F. coronata* and *F. opposita*; and occasionally two exotics, *F. benghalensis* and *F. carica* (the last-named being the cultivated edible fig) (Braby 2000). Within south-eastern Queensland this species readily breeds on two "sandpaper" figs, *F. coronata* and *F. opposita*; but surprisingly has not been observed feeding on another related native "sandpaper" species, *F. fraseri* (John Moss pers. comm.).

Biology

The life history of *P. innotata* is known and has been documented by Common & Waterhouse (1981), Braby (2000) and Sankowsky (2020).

Adult flight is rapid, particularly the males. When defending small territories, males settle with the head slightly angled downward (Fig. 1). During the afternoon in my garden, I have noted that the males defend small territories on trees growing adjacent to the host tree rather than the host tree itself. This tree is roughly 5 metres in height. Males do not appear to show common lycaenid hill-topping behaviour. The females fly within close proximity of their host trees, where they often settle on either side of the larger-sized leaves.

Occasionally, when perched the adults open their wings at approximately 45° facing towards the sun (Fig. 6). In my garden I noted that a male remained perched on his territorial leaf rather than finding shelter during a mid-afternoon period of moderate to heavy rainfall.

Fig. 6. Perching female

Within south-eastern Queensland the males of this species should not be confused with any other species. The females could be confused with superficially similar-patterned females of genus *Eirmocides* (formerly *Candalides*), i.e. *E. absimilis*, *E. consimilis* and *E. margarita*. However, these three species can be recognised by a series of specifically positioned tiny black spots (most marginally) and the paler fine pencilling-like marks on the underside of the hindwing; and they all have a larger wingspan of approximately 30 mm. *P. innotata* females are significantly smaller, being, on average, 25 mm. Adults from north Queensland can easily be confused with several other *Philiris* species and require close examination to correctly identify, particularly those from Cape York Peninsula.

Although I haven't regularly observed adults feeding, they are often attracted to the flowers of Lemon Scented Myrtle (*Backhousia citriodora*, Myrtaceae), in my garden. When feeding, the wings remain closed.

During December 2021, a female was observed laying eggs on a cultivated Creek Sandpaper Fig (*F. coronata*) growing in my garden at Beaudesert in south-eastern Queensland. She settled on a leaf, then with wings closed walked around to the underside where a single egg was laid. This pattern was continued several times

over a 15 minute period. I noticed that the eggs were only laid beneath mature leaves and not on young leaves or fresh shoots that were present. Females oviposit between mid-morning and mid-afternoon in sunny conditions. Eggs are white, mandarin-shaped (when viewed laterally), approximately 0.6 mm wide and 0.5 mm high, and with a series of tiny pits and small spines (Fig. 7).

Eggs were collected and larvae raised in captivity to adults. First instars did not consume the eggshell after emergence and fed during the evening, eating tiny irregular patches into the hard lower epidermis of the leaf they were resting beneath. During daylight they were observed resting on a pad of fine silk along secondary veins on the underside of the host plant leaf. Larger larvae also had a similar behaviour (Braby 2000). Mature larvae could be faintly heard feeding on the hard leaves! The larvae reached a length of 13 mm at maturity after completing five instars (Figs 8–12).

Fig. 7. Egg

Fig. 8. Larval instar 1

Fig. 9. Larval instar 2

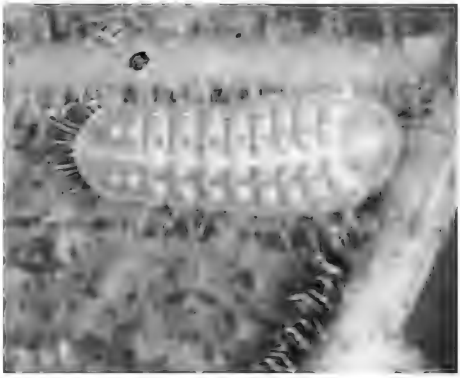


Fig. 10. Larval instar 3

Fig. 11. Larval instar 4

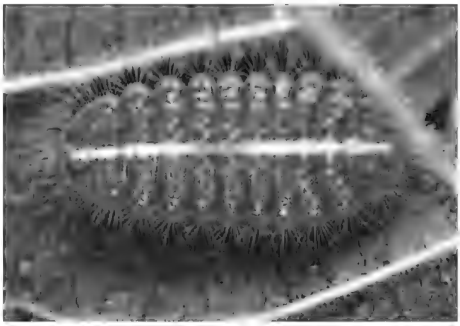


Fig. 12. Larval instar 5

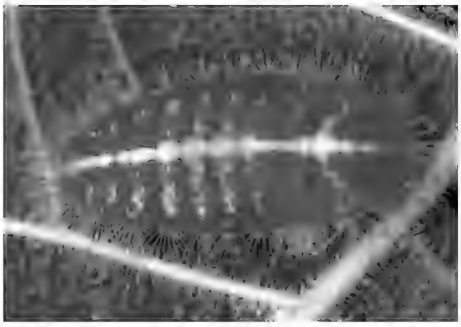


Fig. 13. Pre-pupa

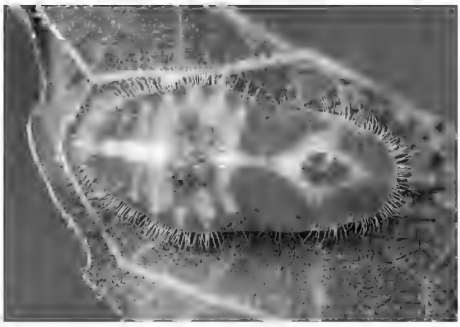


Fig. 14. Pupa dorsal

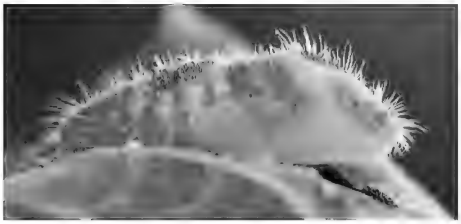


Fig. 15. Pupa lateral

Larvae can be detected beneath the host leaves by finding characteristic larval feeding scars (Fig. 16). They are usually found solitary although I once found three beneath one leaf (Fig. 17). In my garden, larvae are occasionally attended by one or more small black ants of the genus *Crematogaster* (Figs 18, 19).

Fig. 16. Characteristic larval chewing pattern

A third instar larva was observed moulting its skin to fourth instar (Fig. 20). On one occasion in my garden, I found several mature larvae in late September 2021, indicating they are able to survive mild frosty conditions.

The hairy pupae, which measure 11 mm in length, are also found beneath the host tree leaves close to where they feed (Figs 14, 15). They are typically attached to a thin pad of silk by the cremaster and a central girdle as described in Braby (2000).

One adult in captivity emerged at approximately mid-morning. The total time from egg to adult in Beaudesert during December–February was 53 days, with egg duration 11 d, larval duration 31 d and pupal duration 11 d.

Within the boundary of the Scenic Rim Regional Shire, south of Brisbane I have adult records from October until May. There are possibly three generations per year in this region, which likely depends on rainfall and humidity levels.

Acknowledgements

I thank John Moss and an anonymous reviewer for additional suggestions to the manuscript.

Fig. 17. Three larvae located below single leaf

Fig. 18. Larva with single *Crematogaster* ant

Fig. 19. Larva with several *Crematogaster* ants

Fig. 20. Larval instar 3 to 4 ecdysis (moulting)

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Leps in books 5: The books we wish we had or how to deal with the Geometridae

Roger Kitching

The Geometridae are one of the largest of families within the Order Lepidoptera with more than 23000 species globally (Scoble 1999). The Australian fauna comprises about 1300 species (Common 1990). Generally referred to as the loopers because of the 'inchworm' habit of locomotion of their larvae, the adults include the familiar emeralds, carpets, waves, satin moths, bark moths and so on. These English names are generally inherited from those used for the British fauna (see Marren 2020) but are widely if rather inaccurately used here and elsewhere.

This fifth article in my series on books about Lepidoptera is a little different from its predecessors. In those articles I described books relevant to the Australian fauna (or the adjacent Papuan fauna in one case). In this article I draw your attention to a series of books about the European Geometridae that represent, in modern times at least, one of the finest sets of their kind ever produced. There are about 800 species of Geometridae in the European fauna: less, but not that much less, than the known Australian fauna. So it is not an impossible dream that some genius will produce a comparable work for our fauna – although this is definitely an article about book-envy in its greenest form!

Let's start by reviewing modern books which describe and, in particular, illustrate the Australian geometrid fauna. These are the works to which one turns when trying to identify a species by comparison with a high quality illustration. Note that sometimes this is simply not possible and dissection or bar-coding is necessary.

As for all moth groups the starting place must be Common's magnificent work, *Moths of Australia*, first published in 1990 (see Kitching & Edwards, 2020, for a conspectus of almost all books on Australian moths). Ian Common devotes 19 pages of his 535 page work to the Geometridae. He present images of 130 mounted specimens, 56 of which are in colour (plus 33 photos of larvae and living adults). This represented a considerable expansion on the illustrations in his earlier (1963) moth book published by Jacaranda Press which contained a total of 22 images of adult Geometridae of which only four were in colour.

The two volumes by Buck Richardson (2008, 2015) added considerably to the available images of adult geometrids focussing on the fauna of North Queensland. Richardson's 2008 volume includes images of 74 species and the 2015 work, 168 species.

The *Moths of Victoria* series by Peter Marriot and his team includes four volumes on the Geometridae (Marriott 2011 – Part 3, 2012 – Part 4; Hewish *et al.* 2014 – Part 5, 2016 – Part 7) illustrating, in total, about 580 species. Part 3 deals with the species of Larentiinae and Sterrhinae recorded from Victoria and illustrates about 130 species. The attached compact disk expands the number of images to include males and females, as well as live adults and details of seasonal times of occurrence. The work also includes images of known but unnamed species. Part 4 deals with the Oenochrominae and Geometrinae and illustrates set specimens of 180 species. The CD expands the number of images to include males and females, upper and undersides as well as living adults. Again known but unnamed species are included on the disk. Parts 5 and 6 each deal with sections of the very large subfamily the Ennominae. Part 5 deals with the Tribe Nacophorini and, as with previous volumes, illustrates all species recorded from Victoria (except one as it turns out). The volume includes about 160 species. The attached CD expands the number of images and includes live images. Finally, Part 7 completes treatment of the Ennominae (and the family) by illustrating 76 species of Boarmini plus 33 species from smaller tribes (or in the case of four, tribally unassigned species). Again the CD expands coverage as in the preceding volumes.

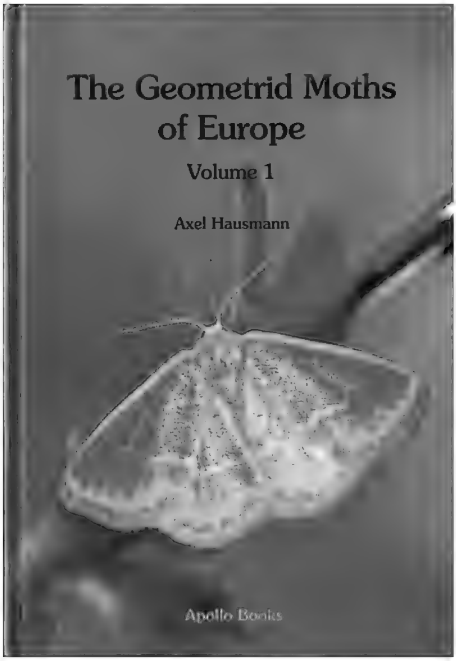
Peter McQuillan and colleagues (2019) produced a work on the moths of South Australia which includes excellent images of forty-eight species of geometrids from the region. This work is exceptional inasmuch as it illustrates full life-histories for almost all the included species.

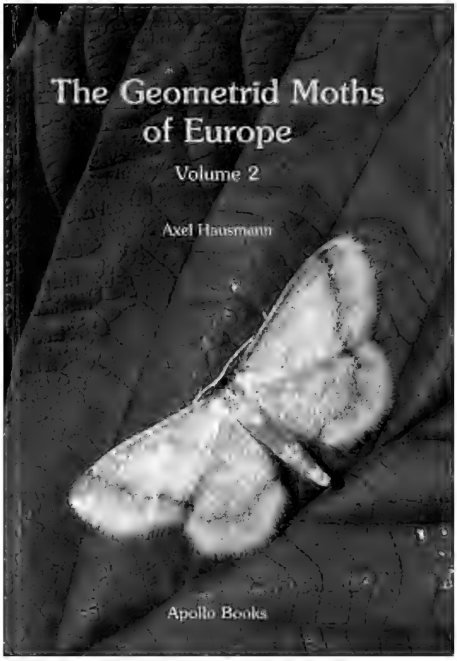
Finally and most recently Glenn Cocking, Suzi Bond and Ted Edwards (2022) published on the moths of the Australian Capital Territory. They illustrated just over 200 named species of geometrids. Further in many cases they pictured males and females showing clearly the frequent sexual dimorhism within the family. Where known many larvae were also shown. As I have noted elsewhere (Kitching 2023) their book has considerable utility beyond the A.C.T. especially in the south-east quadrant of our continent.

A number of on-line resources are also essential aids for identification of Australian geometrids. I do not deal with all of those here but three are of especial note.

Almost all species of Lepidoptera in the Australian National Insect Collection, including many that are recognized but not named, have been 'bar-coded'. This means a standard section of their mitochondrial genome has been analysed. For animals the most commonly used section of the genome for this purpose is the cytochrome *c* oxidase gene (commonly referred to as the CO1 gene). This

information is stored on the so-called BOLD database housed in Canada. One requirement of this procedure is that a photograph of the specimen from which the bar-code was derived must be included in the database. The useful spin-off for the would-be identifier of moths is that there is, accordingly, at least one picture of almost all Australian moths held in the searchable BOLD database (boldsystems.org). It is a laborious process plodding through the images trying to match up a specimen but if some pointers have been gained from other sources (such as the books already mentioned or the web-sites described below) then it can be useful. Simpler 'compare-the-picture' approaches can be employed using two other databases of images.

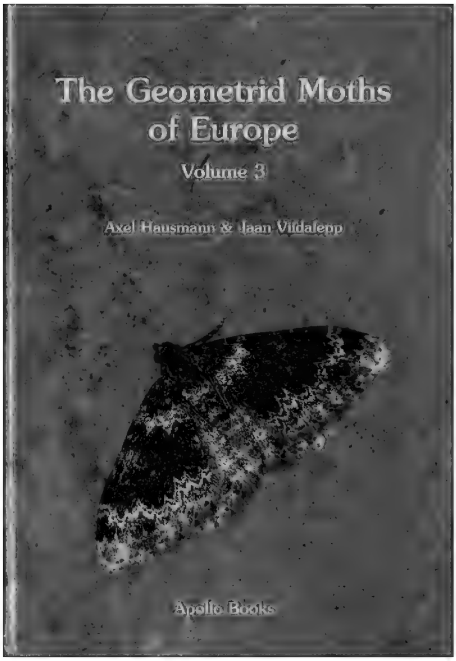


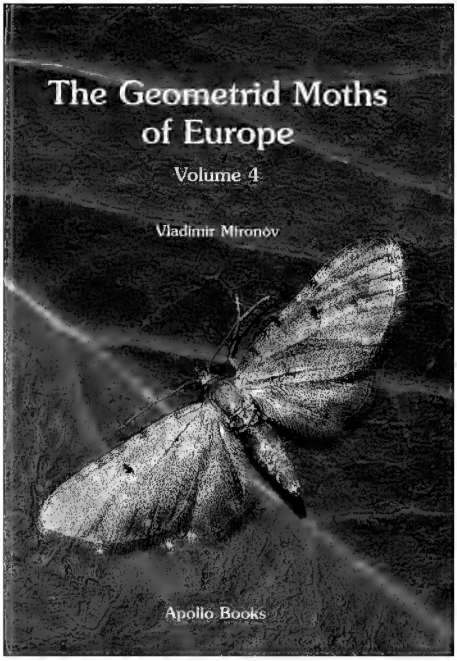


The CSIRO resource *Australian Moths Online* is now available again via the Atlas of Living Australia (https://moths.csiro.au/). This resource is the brain-child of Len Willan who has worked tirelessly to photograph specimens in the ANIC and other collections and add them progressively to the on-line database. Coverage is patchy but growing. Some families are very well covered and the set of images is a real aid to identification. Unfortunately coverage of the geometrids has so far lagged behind. A total of 85 species of geometrid have been incorporated to date (site accessed January 6th 2023).

Finally among electronic resources I mention the set of images created by Don Herbison-Evans and presented on the website of the Coffs Harbour butterfly house (http://lepidoptera.butterflyhouse.com.au/geometridae/geometridae-moths.html). This site offers images of 832 species of geometrid and is probably the best starting point for any attempt at identification of more than half of our fauna.

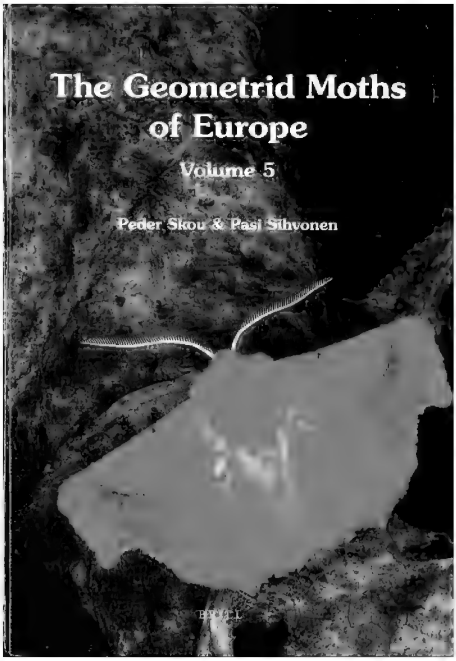
So much for picture-based identification of the Australian geometrids: it is hard work and no one resource will do the job. Further, few if any of the resources mentioned illustrate more than one or two individuals of each species (*Moths of Victoria* is best in this respect, *Moths in the A.C.T.* for sexual dimorhism). Some groups of Geometridae, particularly the Ennominae, are notoriously variable in their wing patterns so comparison with a single image may not help in pinning them down (no pun intended). This is where the *Geometrid Moths of Europe* shows the way.

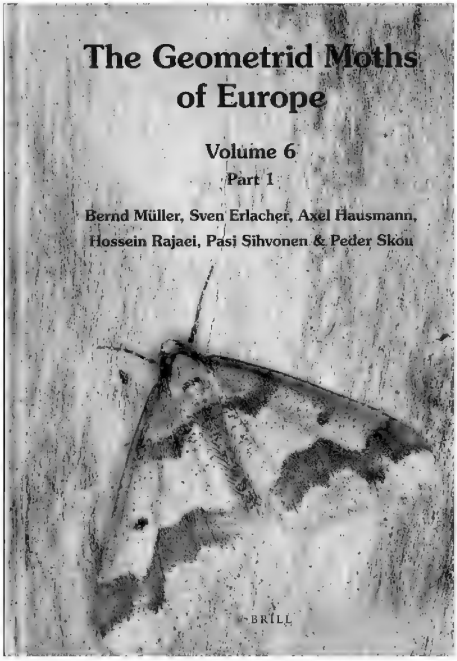




In 2001 Axel Hausmann published the first volume in what was to become the seven volume series covering all European geometrid moths. That volume introduced the series, the family, the history of study, the economic importance and the general biology of the family as well as detailed taxonomic accounts of all species in the 'minor' subfamilies (Archiarinae, Orthostixinae, Desmobathrinae, Alsophilinae) plus the 30 European

Geometrinae. This volume set the standard for all subsequent works in the series. The colour plates illustrate between four and *eighteen* adult individuals of every species capturing the aforementioned within-species variation that is so challenging in the Geometridae (see below). The colour plates are complimented by line drawings of male and female genitalia for all species. Text accounts for each species comprise a descriptive diagnosis, accounts of the genitalia, distribution (with maps based on point records), life history, habitat preferences and notes on similar species. Although this particular volume did not need to solve any thorny systematic problems or describe new taxa later volumes certainly did.

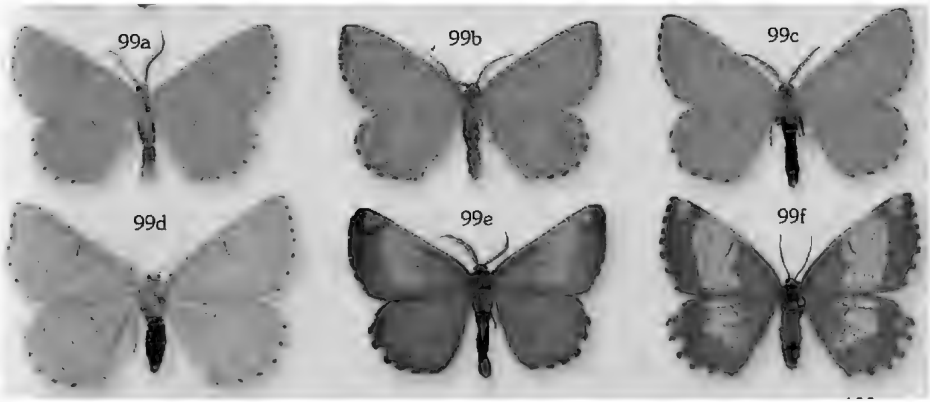




Six further volumes followed authored by Hausmann and (or) various European colleagues. In 2003 Volume 3 was published covering the 143 species belonging to the challenging tribes of the Larentiinae, the Perizomini and Eupitheciinae, by Russian specialist Vladimir Mironov. Attention then turned to the 268 species of the Sterrhinae with Volume 4 appearing in 2004 (Hausmann 2004). Completion of the account of the Larentiinae had to wait until 2012 when Volume 3 appeared (Hausmann & Viidalepp, 2012). That just left the huge subfamily Ennominae with its several very challenging and taxonomically confusing genera such as *Thera* and *Peribatodes.* This subfamily was eventually

completed (and the various 'problem' genera clarified) in three volumes, the first by Skou and Sihvonen appeared in 2015, and the two volumes covering the remaining tribes by Müller and colleagues in 2019.

All of these volumes, like the first, published multiple images for each species capturing the often substantial within species variation. By way of example I present here part of Plate 11 from Volume 5 showing six morphs of *Angerona prunaria*, known as the Orange moth in English (and, rather more informatively, as the Nut-tree Moth, *Phalène du noisetier*, in French).



These volumes were initially produced by the specialised entomological publishers, Apollo, based at Stenstrup in Denmark. It seems one of the authors of the geometrid volumes, Peder Skou, was also the driving force behind Apollo Books. By 2021 Apollo Books was no more and their stock was passed to Bioform, German dealers in entomological books (*www.entobooks.de*). From 2015 on the geometrid volumes were produced by Brill in Leiden in the Netherlands. Brill is a much more general academic publisher with a vast list of scholarly titles. The change of publisher notwithstanding, all seven geometrid volumes show very high production values and are uniform in size and appearance.

The volumes are expensive and, clearly, not for everyone – I scrounged review copies of the two final volumes from the publisher proving writing reviews and bibliographies can be profitable! Nevertheless if you can locate a copy then careful inspection will show you, in my opinion, just what can be done with a large fauna, three centuries of amateur and professional research, and authorial enthusiasm. A few of the volumes acknowledge financial support from various European agencies and foundations, others do not. In those cases we can only assume that sheer dedication and tenacity, and a willing publisher, paid off.

Acknowledgements

I am grateful to Brill Publishers, Leiden, for providing review copies of Volumes 6a and 6b. Dr Jürgen Schmidl of Bioform, Erlangen, Germany, kindly gave me a copy of Volume 1 which set running my special interest in this series .

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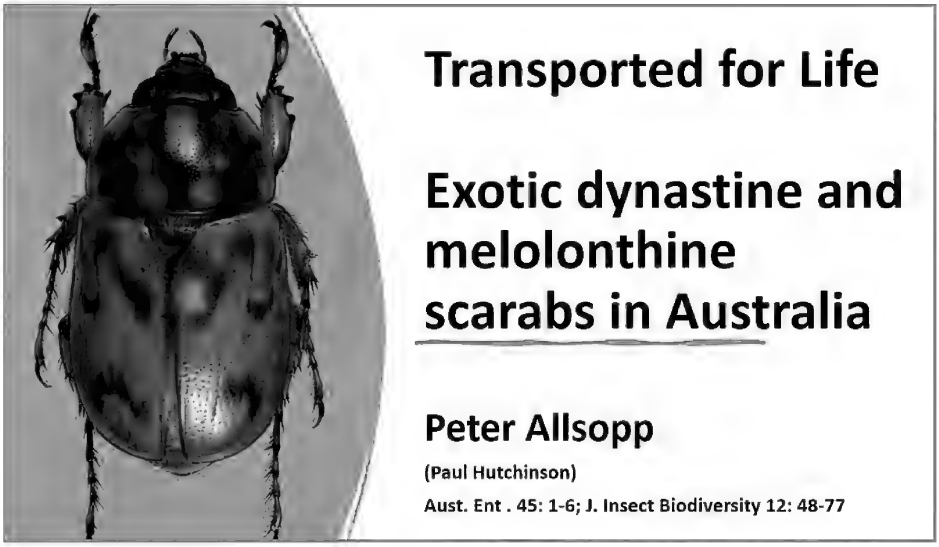
Transported for Life – Exotic dynastine and melonthine scarabs in Australia

A transcript of a presentation by Dr Peter Allsopp, Guest Speaker at the BOIC General Meeting, Karawatha Forest Discovery Centre, 13 August 2022

Trevor A. Lambkin



The beetle family Scarabaeidae is worldwide, occurring on every continent except Antarctica. In Australia, there are at least 2500 described species in six subfamilies, with two of these subfamilies being dung feeders, Aphodiinae and Scarabaeinae. The other four subfamilies, Cetoniinae, Rutelinae, Dynastinae and Melonthinae are phytophagous as larvae and mostly as adults.

Several exotic melonthine species have made their way to Australia, with some now established. Determining how they have come usually requires some detective work. In the Tribe Macrodactylini, *Plectris aliena* is a minor pest of lawns in the United States (first detected in 1934) and Australia (first detected in 1968), originating in Paraguay where it is relatively uncommon. In Australia, it is currently known from around Casino, Sydney and Newcastle. While the exact mode of transport from its home of origin to the United States and Australia is unknown, it is thought that perhaps a gentleman by the name of William Lane may be responsible. Lane and 237 Australian followers established the socialist groups Colonia Neuva

Australia and Colonia Cosme in Paraguay in 1893. Both groups dismantled soon after with members returning from Paraguay to Australia and the United States. Could Lane and his followers possibly have transported *P. aliena* to the United States and Australia in potted plants?

Another South American species native to Argentina in the tribe Cyclocephalini, *Cyclocephala signaticollis* (Fig. 1) is a pest of turf grasses in Australia. It was first collected in Sydney in 1936 and is now known in south eastern Australia from Mapleton south to Melbourne and Adelaide. It is speculated that *C. signaticollis* arrived as larvae in soil transported by ship from Buenos Aires, Argentina.

The African black beetle (*Heteronychus arator*) (Fig. 2) is the most successful invader of many countries. Native to Africa south of Chad, including Madagascar and the Comores, its larvae feed on the roots of a wide variety of plants. The larvae are short-lived while the adults are relatively long-lived. It is now widely distributed, occurring in Australia, New Zealand, Hawaii, Papua New Guinea and Brazil. First collected in Australia in 1920 in Sydney, it is now widely distributed across the mainland.

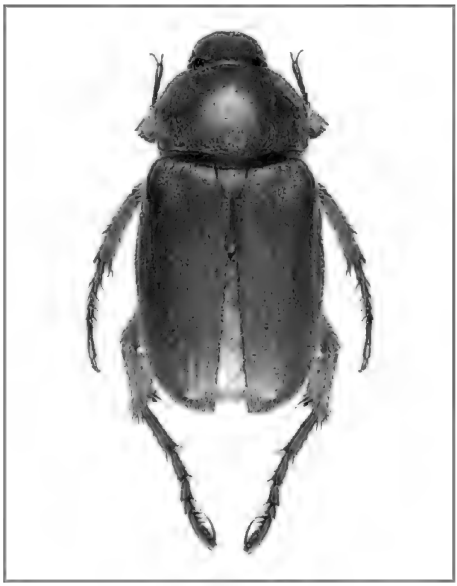


Fig. 1. *Cyclocephala signaticollis*

Again, it is proposed that the adults were brought into Australia in potted plants. Another scarab, *Temnorhynchus retusus*, native to South Africa, seems to be a poor disperser as, since being first collected in 1958 at Sydney (where it is a lawn pest), it has only spread to the south coast of New South Wales, and to Albany in Western Australia in 1979.

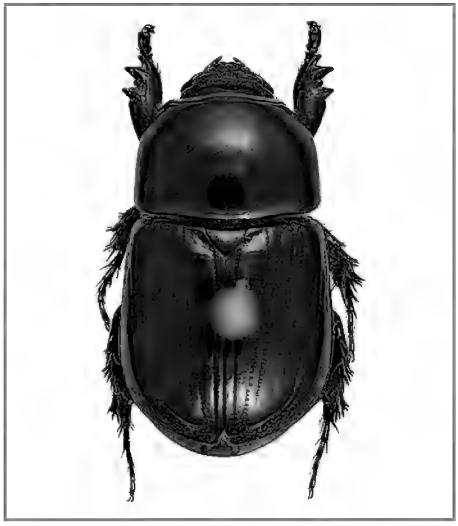


Fig. 2. *Heteronychus arator*

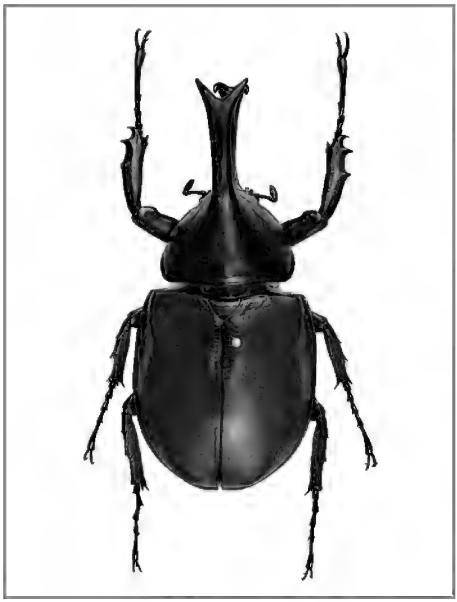


Fig. 3. *Xylotrupes carinulus*

It has also spread to Hawaii. *Papuana woodlarkiana* is a very common species across New Guinea and adjacent islands (Kai and Buru). Interestingly, it is known in Australia only from Iron Range/ Lockhart River, being first recorded in 1961. It is thought that the beetle may have hitched a ride from New Guinea to Lockhart River on a US bomber during the Second World War.

A naturally occurring dynastine in Torres Strait, *Xylotrupes carinulus* (Fig. 3), has only recently been identified and was found to be specifically different to the mainland Australian *X. australicus*. It is the dominant species in New Guinea and up till recently it was confused with the Australian species. It is now known to occur on most of the Torres Strait islands and has different male genitalia and slight colour difference to the Australian species. Yes, it was previously unrecorded but always occurred in Torres Strait.

Some species have been recorded from Australia, but the records are thought to be erroneous, such as *Phyllognathaus degener* from Coen and *Oryctes nasicornis* from Lake King, in Western Australia.

New incursions are unlikely to come unassisted (wind-born or direct flight) but will rely on larvae coming in potted plants. With current biosecurity protocols, this is unlikely to happen, but freight aircraft could be a likely route, which is how the Japanese beetle (*Popillia japonica*) (Fig. 4) arrived from

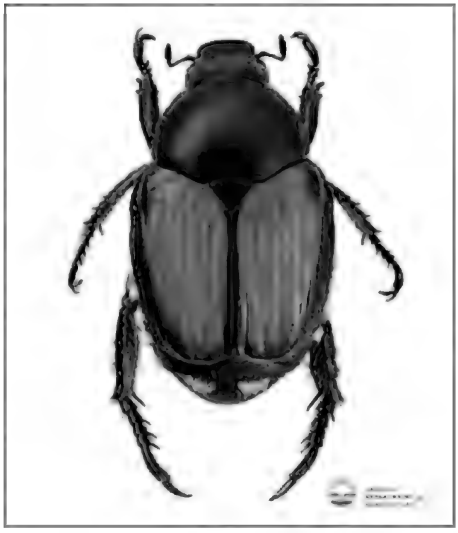


Fig. 4. *Popillia japonica*

the USA to the Azores and to northern Italy. Some species such as the Japanese beetle are listed as high-priority pests by Plant Health Australia.

In conclusion, species that are established and that have spread widely are termed invasive, species that are established but have not spread widely are referred to as sleepers, while some introduced species are known in Australia but have not spread at all. Some species, whose distribution extends from New Guinea into northeastern Australia can be just newly discovered, while some incursion records are considered doubtful.

Wesley Jenkinson, 2022 recipient of the Entomological Society of Victoria's J.C. ("Zoo") Le Souef Memorial Award

John T. Moss

Wesley Jenkinson is well known to readers of *Metamorphosis Australia* for his regular articles on butterfly life histories, commencing in 2008 and continuing to the present; and undoubtedly has his latest contribution in this current issue. Due to his attention to detail and photographic prowess, these beautifully illustrated articles usually show images of all stages of the butterfly's life cycle, as well as including detailed notes on his personal observations.

Because I work closely with Wesley, when the Victorian Entomological Society's "Zoo" Le Souef Award was offered for external nominations last year I was asked by both the Queensland Naturalists' Club Inc. and the Butterfly and other Invertebrates Club Inc. to prepare a nomination for Wes on their joint behalf. The nomination document was quite lengthy with several appendices, but the following is reproduced (in full) from the covering letter and contains the main biographic details:

> "*Wesley observed and collected butterflies privately from the age of four until 2003, aged 36, when he joined the Butterfly and other Invertebrates Club (BOIC) Inc. and the Entomological Society of Queensland, becoming involved in some of the latter's Bugcatch excursions/expeditions. It was during this time that I first met Wes and formed an immediate rapport with him.*
>
> *The first Bugcatch he attended was at the then, recently dedicated, Bendidee National Park in March 2003, where he first met Rod Hobson, Resource Ranger from the Queensland Parks and Wildlife Service (QPWS), operating out of their Toowoomba office. Since that time Wesley has often been invited to (and has attended in a voluntary capacity) many official field surveys that were conducted, initially within the Toowoomba-Dalby regions of QPWS, but later even further afield in remoter parts of Qld.*
>
> *Within the BOIC sphere, Wesley was always keen to join in any activity that*

involved daily excursions to new sites where he was able to see different butterfly larval host plants and find eggs and larvae of various species. These he was able to breed through, taking detailed photographs of their life histories. Several of these life histories have had limited published information, and his images were often the first to be obtained for any particular species. At these times, where appropriate, he would often catch new species to add to his collection. He has always been willing to share this information with other members of the various organisations.

Much of this information (as well as from his other sources) was used as the basis for a large number of articles/papers he wrote for the BOIC popular/ scientific invertebrate magazine Metamorphosis Australia, over the years 2008 to the present.

Wesley's membership of the Queensland Naturalists' Club followed as a consequence of wanting to join me on long excursions/camps for extended locations far from our homes within rural locations in Queensland and parts of northern NSW. These were well organised by the "Nats" and Wesley became quite popular with members wanting to learn more about butterfly life histories, many of which he was able to show them in the field. Several of these long excursions were to protected areas in Queensland where, with the aid of QPWS permits (see below), we were able to do comprehensive surveys of butterflies, cicadas and later, moths as well.

The requirement to produce official reports was made easier for me when Wes was able to provide annotated species lists of the butterflies (and later moths) which I was able to use as appendices to my reports. In two cases the information in those reports became the basis for a joint scientific paper that was published in the Queensland Naturalist. These two, are the Butterflies of Kroombit Tops and Bulburin National Parks, Boyne Valley, Central Coastal Queensland, surveyed in April 2011 and the Butterflies of Byfield National Park & Shoalwater Bay Military Training Area, surveyed in July 2010.

Another aspect of Wesley's developing interests was his use of mercury vapour lamp generated UV light traps ("light sheets") for attracting moths and other night flying insects. He did this purely in a voluntary capacity in conjunction with Bugcatch programs undertaken jointly by the Society, Queensland Museum and Queensland Parks and Wildlife Service personnel. In addition, "light sheet" evenings have been done at the behest of some Greater Brisbane catchment groups, the Scenic Rim's Fassifern Field Naturalists' Club, as well as during

evening sessions on QNC camps where, as usual, he shared his knowledge among the participants in attendance.

Following the Entomological Society's collaboration with the QPWS, a permit system evolved, which enabled both professional and citizen scientist entomologists to access national parks and other protected reserves to undertake both salaried and volunteer work. Wesley took advantage of this arrangement which enabled him to access further natural areas. The information on species Wes observed and/or collected was passed back to the QPWS via the Society in the form of reports and annotated species lists, eventually for both moths and butterflies as his interests expanded. See example of one of these data lists on Excel [Consolidated butterfly list for Byfield NP & Shoalwater Bay MTA] attached as Appendix G. Most of this data has been incorporated on to the Wildnet data base of the Queensland Department of Environment and Science and a large proportion forwarded for incorporation into the Atlas of Living Australia.

Being a member of a number of like-minded organisations has enabled Wesley (as for me) to network effectively and efficiently to promote aspects of the natural environment to both our fellow members as well as members of the public. Although Wes generally has a retiring nature, when talking with others on his favoured topics communication flows easily, and the process of mentoring occurs naturally."

Native flowers for attracting beneficial insects and butterflies

Peter Storer

This is a paper I presented to BOIC at the Mitchelton Library on 12 November 2022.

This story began about a decade ago when Bob 'the Beeman' Luttrell installed several stingless bee (*Tetragonula carbonaria*) hives on my property in Wights Mountain, Samford valley on the proviso that I recorded the native flowers that the bees most favoured. Over the past 18 years, I have planted over 650 native species and cultivars on my 3.5-acre block, so there is plenty of diversity. Once I began my observations, I couldn't help noticing the other beneficial insects and butterflies that were also visiting the flowers.

As a 'native plant person', it surprised me that local food grower, Millen Farm, recommended only exotic flowers, such as salvias and marigolds, for attracting beneficial insects to the veggie patch and orchard. I've seen Gardening Australia do the same, so I decided it's time to promote native flowers that serve this valuable purpose. My recommendations of the best native flowers are not based on scientific data (I didn't do comparative counts), but merely on personal observations over many years, mainly in my own garden.

Small plants suitable for any sized garden or courtyard

Top pick: Samford Holly (for sheer diversity of insects attracted)

A perfect native substitute for salvias is Pink Germander (*Teucrium argutum*), which a low spreading herb to 20 cm with clusters of pink to mauve flowers that are relished by Blue-banded Bees (Fig. 1). The similar flower structure of native *Coleus* (formerly *Plectranthus*) is equally attractive to beneficials and there are dozens of species from South-East Queensland alone to choose from that will suit almost any garden situation from full sun to shade.

Other low-growing plants include Queensland's Midjim Berry (*Austromyrtus dulcis*) and the closely related Midgen Berry (*A. tenuifolia*) from New South Wales. The former is a prostrate plant to 0.5 m with weeping fine-leaved foliage and lovely pink new growth, while the latter is a more upright small shrub to ~1 m. The white flowers of both species attract a myriad of beneficial insects (Fig. 2) and both have delicious grey-spotted edible berries.

Many native daisies (Family Asteraceae) are attractive to beneficials and butterflies, including the popular paper daisies (*Xerochrysum bracteatum*). A less commonly grown local daisy is the very hardy Blue Bonnet (*Centratherum riparium*), which typically grows to 0.5 m in sun or semi-shade. The pink to purple flowers attracts a range of beneficial insects and butterflies (Fig. 3).

The tubular flowers of mint bushes (*Prostanthera* spp.) are reliable insect-attractors. The Cut-leaf Mint Bush (*P. incisa*) is from southern states but does well in Brisbane gardens in full sun or part shade. The standout cultivar of this species is 'Minty' with its very dense foliage and prolific mauve flowers.

The bluish tubular flowers of the oddly named Koala Bells (*Artanema fimbriatum*) are a magnet for Blue-banded Bees, which will seek it out in my home nursery. This upright herb grows to 60 cm in full sun or semi-shade and requires some moisture.

Plants that flower in the shade are always very useful in the garden, so it is worth seeking out Cape Daphne (*Phaleria octandra*), which is a hardy, upright shrub with glossy leaves and grows to less than 1 m (Fig. 4).

Another shade-loving species is the local Native Hypoestes (*Hypoestes floribunda*), which, as its species name suggests, produces a profusion of mauve flowers in winter when little else is flowering. This upright understorey herb to 0.5 m will self-seed to produce a small grove of beneficial-insect-attracting plants.

Fig. 1. Pink Germander with Blue-banded Bee

Fig. 2. Midjim with Honey Bee

Fig. 3. Blue Bonnet with Common Grass Yellow

Fig. 4. Cape Daphne with hoverfly

The Blue Umbrella (*Mackinlaya macrosciadea*) is another understorey shrub from North Queensland, typically to 1 to 1.5 m, with glossy compound leaves and large umbels of small nectar-rich flowers that are loved by hoverflies. The flowers are followed by bunches of powder-blue berries that persist on the plant for many weeks. It can grow and flower in deep shade.

Samford Holly (*Graptophyllum spinigerum*) is a very adaptable small shrub to ~1 to 1.5 m with glossy leaves and an upright habit. It will grow in full sun to full shade in a range of soils, but looks its best in a semi-shaded, well-mulched position. The tiny white tubular flowers are an absolute magnet for a huge range of insects, including honey bees, many native bees, hoverflies and butterflies (Figs 5–7). This plant should be in every Brisbane garden.

Fig. 5. Samford Holly with Carpenter Bee

Fig. 6. Samford Holly with Australian Painted Lady

Fig. 7. Samford Holly with Meadow Argus

Shrubs, small trees or other plants suitable for most suburban gardens

Top pick: Lime Berry (perhaps the best all-round wildlife-attracting plant)

Most people think of grevilleas as wonderful bird attractors, but the rich nectar they produce is used by many insects too. I've found that the cylindrical flowers (such as Honey Gem) and toothbrush flowers (such as Strawberry Blonde) seem to be used mainly by birds, but the spider flowers (e.g. *G sericea*) are more likely to attract insects such as blue-banded bees and butterflies (Figs 8, 9). There are many

Fig. 8. *Grevillea sericea* with Blue-banded bee

Fig. 9. *Grevillea* Diane's Blush with Common Crow

grevillea species and cultivars that grow to less than 2 m, but they prefer full sun and good drainage. They should be fertilised only with low-phosphorus native fertilisers.

Similarly, bottlebrushes and paperbarks (now all *Callistemon* spp.) are often grown as bird attractors, but they are equally loved by a range of insects, including butterflies (Fig. 10). Some *Callistemon* species are large shrubs or trees, but there are numerous cultivars small enough for suburban gardens (check with your local nursery).

Fig. 10. Bottlebrush with Scarlet Jezebel

There many tea-trees (*Leptospermum* spp.) small enough for the suburban garden, including cultivars that grow to less than 1 m. These generally flower in profusion in spring and are a magnet for beneficial insects. Most require full sun and reasonable drainage, and benefit from regular pruning to maintain a dense habit.

Other members of the huge Myrtaceae family are also fabulous for attracting bees and other beneficial insects. Most people would be familiar with Lemon Myrtle (*Backhousia citriodora*) and Cinnamon Myrtle or Carroll (*B. myrtifolia*), both of which can be pruned into an attractive hedge, but lesser known are the Curry Myrtle (*B. angustifolia*) and Aniseed Myrtle (now *Syzygium anisatum*). These all have aromatic leaves that can be used to flavour sweet or sour dishes.

The yellow flowers of the many native sennas are a great choice for attracting beneficial insects. The local Pepper-leaved Senna (*Senna sophera*) is hardy

and grows quickly to about 1.5 to 2 m. It can be short-lived, but will self-seed readily.

Grass trees (*Xanthorrhoea* spp.) are fabulous feature plants in the garden and the long flower spikes produce copious nectar that is relished by birds and beneficial insects alike.

The Lime Berry (*Micromelum minutum*) is a medium to large local shrub with an open habit. The large clusters of cream flowers are carried at the end of branchlets and attract a huge range of beneficial insects and butterflies (Figs 11, 12). These are followed by orange to red oval-shaped berries that are loved by frugivorous birds, such as the Olive-backed Oriole. Being a member of the citrus family (Rutaceae), this is also a host plant for the Orchard and Fuscous Swallowtails, so what's not to love? This could be the ultimate wildlife-attracting plant for the subtropics and tropics.

Fig. 11. Lime Berry with Blue Tiger

Fig. 12. Lime Berry with Magpie Moth

Pavetta (*Pavetta australensis*) is another large shrub/small tree that has clusters of flowers that attract beneficials and butterflies (Fig. 13). This hardy plant for a full sun or partly shaded position can be clipped to make a dense hedge or treated as a feature plant with its showy flowers.

Golden Penda (*Xanthostemon chrysanthus*) grows to a large tree in the wild in North Queensland, but it can be easily pruned to size or you could choose a

Fig. 13. Pavetta with teddy bear bee

dwarf cultivar such as Little Goldie. The stunning yellow flowers almost drip with nectar that attracts bees, butterflies and birds. The related Little Penda (*X. verticilliatus*) has creamy flowers and grows to around 2 m.

Bushy Cassinia (*Cassinia subtropica*) is a local shrub from the daisy family, which gets covered in whitish flowers in clusters in spring to autumn that attract many beneficial insects and butterflies (Fig. 14).

Fig. 14. Bushy Cassinia with Lesser Wanderer

Little Evodiella (*Melicope rubra*) is a small tree to 4–6 m with a profusion of bright pink flower clusters along the branches in summer. It another great insect and bird attractor.

Vines and groundcovers for suburban gardens

Top pick: Twining Guinea Flower (not too vigorous)

Vines can be used to grow up trellises or to trail over trees and shrubs or as groundcovers in an open area. They may require regular maintenance to keep them under control. The yellow flowers of Twining Guinea Flower (*Hibbertia scandens*) are magnets for native bees and small butterflies (Fig. 15).

The Wonga Vine (*Pandorea pandorana*) is a fast growing species from dry rainforests. The flowers of the various cultivars come on a huge range of colours and are loved by bees and small honeyeaters. The vigorous Monkey Rope Vine (*Parsonsia straminea*) will climb high into trees or shrubs. When in flower, its presence is often given away by clouds of butterflies and other insects.

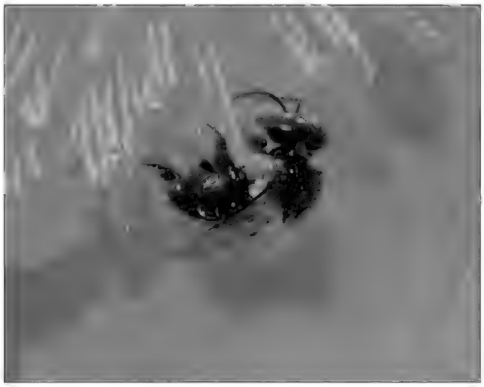


Fig. 15. Twining Guinea Flower with *Tetragonula carbonaria*

Groundcovers can include special cultivars of grevilleas, tea-trees and bottlebrushes discussed earlier. Beach Sunflower (*Apowollastonia spilanthoides*) is a fast-growing prostrate daisy that can spread a few metres in

just 1 year. It bears a profusion of yellow flowers that are very attractive to insects (Fig. 16). Fan flowers (*Scaevola* spp.) add a splash of colour to open areas and are used by a variety of insects. There are many cultivars with blue, pink, mauve or purple flowers, but *Scaevola albida* is generally considered to be the most hardy species.

Fig. 16. Beach Sunflower with honeybee

Fig. 17. Beach Alectryon with *Homalictus flindersi*

Trees for larger properties

Top pick: Native Quince

People living on larger properties have a huge range of insect-attracting trees to choose from. Macadamias, such as the Gympie Nut (*Macadamia ternifolia*), have long racemes of flowers that are loved by many bee species. Native Quince (*Guioa semiglauca*) and Deep Yellowwood (*Rhodosphaera rhodanthema*) are hardy dry rainforest species that become abuzz with a myriad of insects when in flower. The large deciduous White Cedar (*Melia azedarach*) has stunning mauve flowers in spring that are loved by various bees. The flowers of the Beach Alectryon (*Alectryon coriaceus*) may be small but they are packed with nectar and attract a huge range of beneficials (Fig. 17).

Sourcing native plants

Some of the species mentioned in this paper may not be available from mainstream nurseries, but can usually be found in specialised native or community nurseries or plant markets (check out npq.org.au/where to buy).

Butterfly & Other Invertebrates Club Inc. (BOIC), Butterfly & Other Invertebrates Survey, Reservoir Fire Track, Mt Coot-tha
Saturday 15 October 2022

Dawn Franzmann

After a week of rain and overcast skies, this particular morning proved to be very good for a survey. We meandered through part of the wonderful eucalyptus forest on Mt Coot-tha. Annette Dexter had kindly agreed to be our guide along the Reservoir Fire Track. Twenty-one BOIC members and several guests joined our group and 14 butterfly species were observed on the day.

This is the same area in which Annette recorded a sighting of the Tawny Coster at the beginning of the year. However, it was not to be seen on this visit.

Fig. 1. Fringed Heath Blue © Chris Sanderson

Fig. 2. Clearwing Swallowtail © Alan Lovelock

Fig. 3. Black Jezebel © Annette Dexter

Fig. 4. Speckled Line Blue © Annette Dexter

Fig. 5. Tailed Emperor © Annette Dexter

Fig. 6. Orange Ringlet © Alan Lovelock

BUTTERFLY & OTHER INVERTEBRATES CLUB Inc. RESERVOIR TRACK, MT COOT-THA SURVEY SATURDAY 15 OCTOBER 2022		
COMMON NAME Butterfly	**SCIENTIFIC NAME**	**RESERVOIR FIRE TRACK MT COOT-THA**
Fuscous Swallowtail	*Papilio fuscus*	Collected, identified and released, between the hours of 10.00am and 11.30am The survey was conducted on the fire track that eventually leads to the reservoir and down to the Chapel Hill Road.
Clearwing Swallowtail (male)	*Cressida cressida*	
Dingy Swift	*Pelopidas agna*	
Orange Ochre	*Trapezites eliena*	
Black Jezebel	*Delias nigrina*	
Chalk White	*Elodina parthia*	
Wanderer/Monarch	*Danaus plexippus*	
Tailed Emperor	*Polyura sempronius*	
Orange Ringlet	*Hypocysta adiante*	
Meadow Argus	*Junonia villida*	
Glasswing	*Acraea andromacha*	
Speckled Line Blue	*Catopyrops florinda*	
Cycad Blue	*Theclinesthes onycha*	
Fringed Heath-blue	*Neolucia agricola*	
Other Invertebrates		
Spittle Bug	*F. Cercopidae*	
Weevil	*F. Curculionidae*	

Dawn Franzmann
Recorder
15/10/2022

Butterfly & Other Invertebrates Club Inc. (BOIC), Butterfly & Other Invertebrates Survey, Gold Creek Reservoir, Upper Brookfield
Saturday 26 November 2022

Dawn Franzmann

This was our first visit to this location. This area is also home to the Moggill Creek Catchment Group who gave us permission to visit. It was easy to access and a good walking track. We recorded twenty-five (25) butterfly species in flight. Seventeen members and two visitors attended.

Fig. 1. Lesser grass blue (*Zizina otis*) © Penny Mills

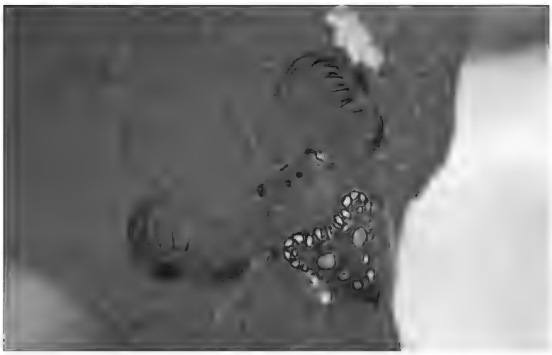


Fig. 2. Common triangle spider (*Arkys lancearius*) © Penny Mills

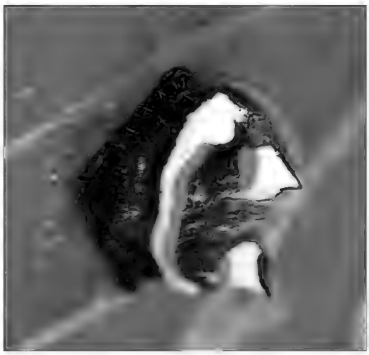


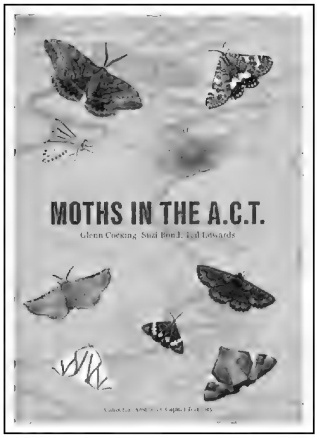
Fig. 3. Two-spined spider (*Poecilopachys Australasia*) © Penny Mills

BUTTERFLY & OTHER INVERTEBRATES CLUB Inc. GOLD CREEK RESERVOIR, UPPER BROOKFIELD SURVEY SATURDAY 26 NOVEMBER 2022		
COMMON NAME **Butterfly**	**SCIENTIFIC NAME**	**GOLD CREEK RESERVOIR UPPER BROOKFIELD**
Orchard Swallowtail	*Papilio aegeus*	Collected, identified and released between the hours of 10.00am and 11.30am
Fuscous Swallowtail	*Papilio fuscus*	
Dainty Swallowtail	*Papilio anactus*	
Clearwing Swallowtail	*Cressida cressida*	
Blue Triangle	*Graphium choredon*	
Pale Green Triangle	*Graphium eurypylus*	
Narrow-brand Grass-dart	*Ocybadistes flavovittatus*	
Lemon Migrant	*Catopsilia pomona*	
Caper White	*Belenois java*	
Small Grass Yellow	*Eurema smilax*	
Common Grass Yellow	*Eurema hecabe*	
Cabbage White	*Pieris rapae*	
Delicate Pearl White	*Elodina perdita*	
Monarch/Wanderer	*Danaus plexippus*	
Common Crow	*Euploea corinna*	
Blue Tiger	*Danaus hamatus*	
Common Brown Ringlet	*Hypocysta metirius*	
Painted Lady	*Vanessa cardui*	
Common Aeroplane	*Phaedyma shepherdi*	
Meadow Argus	*Junonia villida*	
Glasswing	*Acraea andromacha*	
Common Pencil-blue	*Eirmocides absimilis*	
White-banded Line Blue	*Nacaduba kurava*	
Hairy lineblue	*Erysichton lineatus*	
Lesser Grass Blue	*Zizina otis*	
Other Invertebrates		
Two-spined spider	*Poecilopachys australasia*	
Common triangle spider	*Arkys lancearius*	

Trevor and Tina Lambkin
Recorders, 26/11/2022

Moths in the A.C.T. by Glenn Cocking, Suzi Bond & Ted Edwards

Reviewed by Roger Kitching



In 2016 Suzi Bond published *A Field guide to the Butterflies of the Australian Capital Territory.* This excellent book, published by the National Parks Association of the A.C.T., joined other guides to the butterflies of particular Australian states or territories (Tasmania – McQuillan 1994; South Australia – Fisher 1978). In addition, Braby *et al.* (2018) provided a guide to the butterflies (and some day-flying moths) of the monsoonal tropics of the Northern Territory and northern Western Australia. As always, guides to the vast majority of the Lepidoptera – the moths – have proved far more challenging. The series of nine, first-rate booklets on the macro-moths of Victoria is available as is McQuillan *et al*'s'fine book on *Moths of Southern Australia* showcasing 280 selected species found in South Australia and beyond. Suzi Bond has now joined with Glenn Cocking and Ted Edwards to add to this exclusive set with *Moths in the A.C.T.*, the book currently under review.

When I first arrived in Australia, in 1971, I was employed by the then Division of Entomology of CSIRO at their Black Mountain laboratories in Canberra. I soon discovered that, in addition to the sheep blowfly research unit of which I was part, this was also the home of the staff and collections of the Australian National Insect Collection (the ANIC). My first and lasting entomological passion, of course, was the Lepidoptera (with lots of excursions into other Orders) and I became good friends and colleagues of the then curator of Lepidoptera, Ian Common, and his experimental officer, Ted Edwards. With them I began my long education about and acquaintance with the Australian Lepidoptera – a much greater challenge than my earlier meetings with the European and Canadian faunas. Ian and Ted, at that stage, were actively engaged in building up the ANIC holdings through widespread sampling using light sheets and the meticulous collecting and breeding through of larvae of the hugely diverse but poorly known smaller species – the so-called micro-Lepidoptera. The long-term outcomes have included Common's masterworks – the *Moths of Australia* (1990) and his three monographs on the Oecophoridae (1994, 1997, 2000) as well as Ted's collaborative work with Paul Zborowski, *A Guide to Australian Moths* (2007).

Probably the most intensive of the moth collecting carried out during the 1960s and 1970s was in the bush of the Black Mountain Reserve in the A.C.T. A permanent light trap was run there more or less continuously, conveniently placed adjacent to the CSIRO laboratories located at the base of that same 'mountain'. Many species of Australian moths have been described from the material collected in this programme, much of it unique, and these collections have now been further augmented by amateur-driven 'bioblitzs' held on Black Mountain in 2013 and a 2014 effort in the Namadgi National Park, also in the A.C.T. Glenn Cocking and his colleagues estimate that rather more than 2000 species of moths are known from the A.C.T. with more to be discovered as exploration continues. The close association of this fauna with the country's leading lepidopterists (led by the late Ian Common but including many others over the years) has meant that about 80% of the known fauna of the A.C.T. has been named, and even more are known and recognisable within the ANIC.

All of this information would have remained within the ANIC – available, yes; accessible to enthusiasts, yes; easy to use, less so. Working though the hundreds of drawers of the moth-filled cabinets of the Lepidoptera Hall trying to match up specimens (or, even more challengingly, photographs) of moths is not for the faint-hearted. It helps hugely if you can narrow down the material you are trying to name to a family, subfamily or genus before addressing the immensity of the National Collection. This is where the Cocking, Bond and Edwards' book fills a vital gap. First, unless you live in Canberra or its environs, ignore the fact that it addresses only the fauna of the. A.C.T. This is a richly illustrated introduction to almost all the moth families to be found in Australia and its careful use will make the identification of any Australian moth much easier. Of course, if you do live within Australia's south-east corner then you will find many of the species you encounter illustrated in colour here.

The book, though, is much more than an aid to identification (although, I suspect, that is how it will be largely used). Each of the families and subfamilies dealt with here (over 90 in all) is introduced with a summary of its biology including distinguishing features, life-histories and host-plant associations. The whole volume serves well as an introduction and mid-level text to the entire Lepidoptera missing only sections on phylogeny, physiology and chemical biology. The authors emphasise that larger species receive more attention in their work than the micro-moths and, while that may be strictly true, the volume does pay much more attenction to the 'micros' than is to be found in most moth books (*Moths of Victoria* for example has not, so far, dealt with any but the conventional macromoth groups, including the Hepialidae in this informal category).

Most pleasing to me, and yet further evidence of Ian Common's lasting impact on Lepidoptera studies in Australia, are the 30 pages devoted to mallee moths, the Oecophoridae (exceeded, in this work, only by the Geometridae which merit 40 pages). The Oecophoridae are by far the largest family of moths in Australia represented by perhaps 4000 species, about a quarter of the entire moth fauna in terms of species richness (compare this with the Geometridae, represented nationally by about 1300 species). Many oecophorids have evolved close relationships with the Australian flora exploiting families such as the Myrtaceae and Proteaceae as larval food. Virtually all of the described species are Australian endemics. Indeed, the case can be made that if one wishes to pick any group of animals that are quintessentially Australian then the Oecophoridae would be a good choice (remember, about 30% of the mere 330 marsupial species are South American!). This volume illustrates, in colour, almost 150 species of oecophorids either as living adults or set specimens. This is far more than have ever been illustrated in colour in print before which, in itself, represents a valuable resource for identification (but note the website *https://moths.csiro.au/species_taxonomy/oecophoridae/* which illustrates on-line almost 200 species). The monographs on the Oecophorinae by Common were illustrated only in black and white.

The book itself is a handsome A4 paperback of 274 pages illustrated in colour throughout. It was privately published by Glenn Cocking from whom it is available (via *mothsintheact.org*). At $50.00 including within-Australia postage it is a bargain. It is a 'must have' for anybody interested in Australian moths and should join Common's *Moths of Australia* (and perhaps Moulds, Tuttle and Lanes' *Hawkmoths of Australia,* 2020) in pride of place on your moth shelf.

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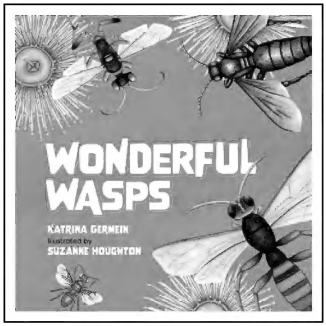
Wonderful Wasps by Katrina Germein, illustrated by Suzanne Houghton

CSIRO Publishing, November 2022

Reviewed by Jenny Thynne



At last! A book celebrating Australia's native wasps, and it's a picture book for children!

Australia has more than 12,000 species of wasps, and this book gives an introduction to them through verse, cleverly revealing the relationships between wasps, their prey and their predators, and their invaluable place in the ecosystem.

The book is also a visual delight, with stunning artwork by Suzanne Horton relating to the verses on each page. Starting with the question "What do you know about wasps?", this book immediately engages the young reader and gets them thinking. There are verses about the life cycle of a spider wasp, about wasps being sky pollinators "like fruit bats and bees", about wasp homes, the amazing fig wasps, about those who dine on wasps such as lizards, birds and dragonflies, and about planting natives that bloom, always accompanied by the remarkable detailed illustrations.

At the end of the book there is an excellent section with additional information about wasps generally, including their lifecycle and a very helpful glossary of some of the terms used in the book.

The endpapers feature 10 different Australian native wasps from a variety of families, and also the European wasp, a pest which has become established in parts of Australia. They also show the relative sizes of these particular wasps. Our native wasps can vary in size from 1 mm to 40 mm.

This book is aimed at children from 3 to 9 years, and is a must for school libraries. There are downloadable teacher notes on the CSIRO website at https://www.publish.csiro.au/book/8057/#forteachers

I have been observing and photographing some of our beautiful native wasps for a number of years, and was over the moon to see this superb addition to the literature about Australian nature that is now being produced for children. This is a book not only for young children to enjoy, but also those who may be reading to them.

Notes

COVER IMAGE

Harlequin Metalmark, *Praetaxila segecia*, the only member of the butterfly family Riodinidae found in Australia from Cape York to Rocky River near Coen.

Photograph courtesy of Claire Watson taken on June 2022 at the Greenhoose, near Lockhart River, Cape York Peninsula.

GUIDELINES FOR AUTHORS

Text to be 11 font size Times New Roman with 1.5 times New Roman spacing. Headings to be 12 font size Arial bolded. The Style Guide/Manual is available to all Authors by accessing the BOIC website, www.boic.org.au. Images are to be a minimum of 300dpi, originals separate to the document and captions provided for each image. Adherence to the deadlines for submission would be greatly appreciated.

All articles/contributions to be submitted to the Editorial Committee at secretaryboic@gmail.com.

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